Exhibit 3

Cannon Expanded Site Inspection Report

Redacted text, table(s), and figure(s) contain(s) personally identifiable Information (PII) that is not publicly releasable under the Privacy Act and Freedom Of Information Act (FOIA), 5 U.S.C. 552.

FINAL

SITE INSPECTION REPORT ADDENDUM 01

CANNON AIR FORCE BASE, NM

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide

Contract FA8903-16-D-0027
Task Order 0004

Prepared for:

Air Force Civil Engineer Center
JBSA Lackland, Texas

March 2019

Submitted by:

amec foster wheeler

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FINAL

ADDENDUM 01 TO THE FINAL SITE INSPECTION REPORT

SITE INSPECTION OF AQUEOUS FILM FORMING FOAM (AFFF) RELEASE AREAS ENVIRONMENTAL PROGRAMS WORLDWIDE

CANNON AIR FORCE BASE
CLOVIS, NEW MEXICO

Project No. RPMO20167118

Prepared for:
Air Force Civil Engineer Center
Joint Base San Antonio – Lackland, Texas

Prepared by:

Amec Foster Wheeler Programs, Inc.

Contract FA8903-16-D-0027
Task Order 0004

March 2019

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ACRONYMS

AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFFF	Aqueous Film Forming Foam
Amec Foster Wheeler	Amec Foster Wheeler Programs, Inc. and its affiliate Amec Foster Wheeler Environment & Infrastructure Inc. collectively
amsl	above mean sea level
bgs	below ground surface
BRAC	Base Realignment and Closure
Cascade	Cascade Environmental
CoC	Chain-of-Custody
DL	detection limit
DO	Dissolved Oxygen
DoD	Department of Defense
ELAP	Environmental Laboratory Accreditation Program
FTA	Fire Training Area
HDPE	high-density polyethylene
IDW	Investigation-Derived Waste
IRP	Installation Restoration Program
ISWP	Installation-Specific Work Plan
ISWPA	Installation-Specific Work Plan Addendum
LC-MS/MS	Liquid Chromatography and Tandem Mass Spectrometry
LHA	Lifetime Health Advisory
LOQ	limit of quantification
µg/L	micrograms per liter
Maxxam	Maxxam Analytical
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
PFAS	per- and polyfluorinated alkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid

PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
PPE	personal protective equipment
PVC	polyvinyl chloride
ORP	Oxygen Reduction Potential
QPP	Quality Program Plan
RSL	Regional Screening Level
SI	Site Investigation
SIR	Site Investigation Report
SOP	Standard Operating Procedure
USAF	United States Air Force
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

EXECUTIVE SUMMARY

This Addendum 01 to the Final Site Inspection (SI) Report (SIR) was prepared by Amec Foster Wheeler Programs, Inc., together with affiliate Wood Environmental & Infrastructure Solutions, Inc. (formerly known as Amec Foster Wheeler Environment & Infrastructure, Inc.)[1], collectively referred to as Amec Foster Wheeler, under Contract No. FA8903-16-D-0027, Task Order 0004, to document the results of follow-on SI activities conducted at Cannon Air Force Base (AFB) in Clovis, Curry County, New Mexico.

Based on a review of the per- and polyfluorinated alkyl substances (PFAS) groundwater analytical data obtained during the November/December 2017 SI at Cannon AFB, it was determined that further evaluation of PFAS in groundwater at, and downgradient of, the installation was required. Concentrations of perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) were detected above the United States Environmental Protection Agency (USEPA) Lifetime Health Advisory (LHA) value of 0.07 micrograms per liter (µg/l); the maximum concentrations of PFOS and PFOA were 24 µg/l and 3.1 µg/l respectively. Subsequent discussions between the Air Force Civil Engineer Center (AFCEC), Cannon AFB and Amec Foster Wheeler determined that further evaluation would consist of installing and sampling a groundwater monitoring well on Cannon AFB at the installation boundary; conducting resampling of six existing monitoring wells where PFAS was detected at concentrations above screening levels; and, collection of water samples at off-base properties within 4.0-miles southeast (downgradient) of Cannon AFB where groundwater is used as a source of drinking water for human consumption.

The data presented in this SIR Addendum 01 were collected and evaluated in accordance with the Final Addendum 01 Installation-Specific Work Plan (ISWPA) (Amec Foster Wheeler, 2018a) and the General Quality Program Plan (QPP) (Amec Foster Wheeler, 2018b) and are meant to supplement the findings presented in the Final SIR (Amec Foster Wheeler, 2018c). An overview of PFAS and a discussion of the background for each of the aqueous film forming foam (AFFF) release areas were provided in the Final SIR (Amec Foster Wheeler, 2018c).

The purpose of the follow-on SI was to evaluate the potential for off-base migration of PFOS and/or PFOA downgradient of AFFF Release Areas 1 (Former Fire Training Area [FTA] No. 2), 2 (Former FTA No. 3), 3 (Former FTA No. 4), 5 (Former Sewage Lagoons) and 11 (Active FTA).

Follow-On SI PFAS Analytical Results

The presence of PFOS, PFOA, and/or PFOS+PFOA at concentrations above the USEPA LHA value of 0.07 µg/L was confirmed in on-base groundwater monitoring wells MW-Ca, MW-D, MW-Ga, MW-Pa, MW-Sa,

[1] Amec Foster Wheeler Environment & Infrastructure, Inc. changed its name on 6 April 2018 to Wood Environment & Infrastructure Solutions, Inc., to reflect Wood Group's acquisition of Amec Foster Wheeler. All resource documents created and activities conducted under Amec Foster Wheeler Environment & Infrastructure, Inc. remain in place, will be referred to Amec Foster Wheeler, and are executed under Wood Environment & Infrastructure Solutions, Inc.

This section provides information about private drinking water sources. It contains personal privacy or other information that is not publicly releasable under the Freedom of Information Act, 5 U.S.C. § 552, and is maintained in a separate portion of the Administrative Record that is not accessible to the public.

and MW-Ta. The concentrations of PFOS, PFOA and/or PFOS+PFOA were generally consistent with the concentrations detected in November/December 2017 and reported in the Final SIR (Amec Foster Wheeler, 2018c).

Analytical results for newly installed MW-Y confirmed the presence of PFOS, PFOA and PFOS+PFOA at the installation boundary, downgradient of the former sewage lagoon area (AFFF release area 5) where PFOS and/or PFOS+PFOA were detected above the LHA in 2017. The maximum concentrations of PFOS (0.13 µg/l), PFOA (0.0617 µg/l) and PFOS+PFOA (0.192 µg/L) were detected in the duplicate sample; the concentrations of PFOS and PFOS+PFOA exceeded the LHA value.

PFOS, PFOA, and/or PFOS+PFOA were detected at concentrations above the LHA in three off-base water samples ([redacted] confirming that groundwater impacted with PFAS at concentrations above the LHA values has migrated off-base to the southeast.

Perfluorobutanesulfonic acid (PFBS) was not detected in groundwater at concentrations above UESPA Tap Water Regional Screening Levels (RSLs) in on-base or off-base water samples.

Groundwater Receptors

Human receptors via the ingestion pathway were confirmed to be present downgradient of Cannon AFB. Due to the detections of PFOS, PFOA and/or PFOS+PFOA at concentrations exceeding the USEPA LHA values in off-base properties where groundwater is used as a source of drinking water, the United States Air Force implemented emergency response measures to immediately provide alternative sources of drinking water for impacted property owners. Bottled water was immediately offered to impacted property owners to mitigate the ingestion exposure. Routine bottled water delivery service is ongoing at one of the affected properties and will continue until longer term water treatment technologies are implemented. The second property declined the bottled water service; however, they informed the Air Force that instead of bottled water, they prohibited consumption of water for all personnel at the property, a condition that will also continue until water treatment systems are installed.

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1.0 INTRODUCTION

This Addendum 01 to the Final Site Inspection (SI) Report (SIR) was prepared by Amec Foster Wheeler Programs, Inc., together with affiliate Wood Environmental & Infrastructure Solutions, Inc. (formerly known as Amec Foster Wheeler Environment & Infrastructure, Inc.)[2], collectively referred to as Amec Foster Wheeler, under Contract No. FA8903-16-D-0027, Task Order 0004, to document the results of follow-on SI activities conducted at, and downgradient of, Cannon Air Force Base (AFB) in Clovis, Curry County, New Mexico (**Figure 1.0-1**). Based on a review of the per- and polyfluorinated alkyl substances (PFAS) groundwater analytical data obtained during the November/December 2017 SI at Cannon AFB, it was determined that further evaluation of PFAS in groundwater at, and downgradient of the installation was required to evaluate the potential for off-base migration of perfluorooctanesulfonic acid (PFOS) and/or perfluorooctanoic acid (PFOA). Subsequent discussions between the Air Force Civil Engineer Center (AFCEC), Cannon AFB and Amec Foster Wheeler determined that further evaluation would consist of installing and sampling a groundwater monitoring well on Cannon AFB at the installation boundary; conducting resampling of six existing monitoring wells at the installation where PFAS were detected at concentrations above screening levels; and, collection of samples from private water supply wells, within (b) (6) of the installation boundary.

The data presented in this SIR Addendum 01 were collected and evaluated in accordance with the Final Addendum 01 Installation-Specific Work Plan (ISWP) (Amec Foster Wheeler, 2018a) and the General Quality Program Plan (QPP) (Amec Foster Wheeler, 2018b) and are meant to supplement the findings presented in the Final SIR (Amec Foster Wheeler, 2018c). An overview of PFAS, a discussion of the background for each of the aqueous film forming foam (AFFF) release areas, and previous PFAS analytical results were provided in the Final SIR (Amec Foster Wheeler, 2018c).

The United States Environmental Protection Agency (USEPA) Office of Water issued drinking water Lifetime Health Advisory (LHA) values for PFOS and PFOA in May 2016 that replaced the 2009 Provisional HA values. The LHA values for PFOS and PFOA are 0.07 micrograms per liter (µg/L) for each constituent; however, when these two chemicals co-occur in a drinking water source, a conservative and health-protective approach is recommended that compares the sum of the concentrations (PFOS + PFOA) to the LHA value (0.07 µg/L). The LHA values are non-regulatory concentrations of drinking water contaminants at or below which adverse health effects are not anticipated to occur over specific exposure durations (e.g., a lifetime). They serve as informal technical guidance to assist federal, state, and local officials, and managers of public or community water systems in protecting public health when emergency spills or

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other contamination situations occur. A LHA document provides information on the environmental properties, health effects, analytical methodology, and treatment technologies for removing drinking water contaminants. Lifetime Health Advisory values are not to be construed as legally enforceable federal standards and are subject to change as new information becomes available (USEPA, 2016a and 2016b).

While PFOS and PFOA in groundwater are the focus of the LHA , the USEPA has also derived Tap Water Regional Screening Level (RSL) values for perfluorobutanesulfonic acid (PFBS) for which there is a Tier 2 toxicity value (Provisional Peer Review Toxicity Value) (USEPA, 2017a).

Table 1.0-1 below presents the screening values for comparing analytical results for PFOS, PFOA, and PFBS during the follow-on SI. The USEPA and New Mexico Environment Department (NMED) have not issued LHA values or promulgated standards for any other PFAS to date.

Table 1.0-1. Regulatory Screening Values.

Parameter	Chemical Abstract Number	USEPA Regional Screening Level Table (November 2017)[a]		Calculated RSL for Soils and Sediments[b]	USEPA Health Advisory for Drinking Water (Surface Water or Groundwater)[c]
		Residential Soil (mg/kg)	Tap Water (µg/L)	(mg/kg)	(µg/L)
PFOS	1763-23-1	NL	NL	0.126	0.07[d]
PFOA	335-67-1	NL	NL	0.126	
PFBS	375-73-5	130	40	NL	NL

Notes:

a USEPA Regional Screening Levels (2017a) [https://semspub.epa.gov/work/HQ/197027.pdf].

b Screening levels calculated using the USEPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search). The calculated RSLs are based on a total hazard quotient of 0.1 as adopted by the USAF in March 2018 in revised guidance "PFAS Site Objectives and Follow-On Activities"

c USEPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and USEPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

d When both PFOA and PFOS are both present, the combined concentrations of PFOA and PFOS should be compared with the 0.07 µg/L lifetime health advisory level.

mg/kg - milligrams per kilogram
µg/L - micrograms per liter
NL - not listed
PFBS - perfluorobutanesulfonic acid
PFOA - perfluorooctanoic acid
PFOS - perfluorooctanesulfonic acid
RSL - Regional Screening Level
USEPA - United States Environmental Protection Agency

1.1 PROJECT OBJECTIVES

In accordance with Department of Defense (DoD) Instruction 4715.18, "Emerging Contaminants (ECs)" (DoD, 2009), the *Interim AF Guidance on Sampling and Response Actions for Perfluorinated Compounds at Active and Base Realignment and Closure (BRAC) Installations* (United States Air Force [USAF], 2012), and the *SAF/IE Policy on Perfluorinated Compounds of Concern* (USAF, 2016) the USAF will:

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1) Identify locations where there is a reasonable expectation that there may have been a release of PFAS (defined below) associated with USAF actions;

2) Determine if there is unacceptable risk to human health and the environment; and,

3) Address releases that pose an unacceptable risk, including offsite migration.

The primary objectives of this follow-on SI were to:

- Determine whether PFAS are present in groundwater further downgradient of monitoring wells where the presence of PFOS, PFOA and/or PFOS+PFOA was confirmed at concentrations above the LHA); and,
- Determine if PFOS and/or PFOA are present in groundwater at concentrations exceeding the LHA value in off-base water wells where groundwater is currently used as a drinking water source for human consumption.

1.2 PROJECT SCOPE

In order to evaluate the potential for off-base migration of PFOS, PFOA, and PFBS, follow-on SI activities included:

- The installation and sampling of one permanent monitoring well (MW-Y) located at the installation boundary, southeast of monitoring wells MW-Ga and MW-Pa where PFOS, PFOA and PFOS+PFOA in groundwater were detected at concentrations exceeding the LHA. The monitoring well will be screened in the Ogallala Formation with construction consistent with existing on-base monitoring wells.
- Confirmation groundwater sampling was conducted at the six monitoring wells (MW-Ca, MW-D, MW-Ga, MW-Pa, MW-Sa, and MW-Ta) where PFOS, PFOA and/or PFOS+PFOA were previously detected at concentrations exceeding the LHA.
- Conducting an off-base well inventory survey and sampling of off-base water wells where groundwater was being used as a source of drinking water for human consumption. The sampling of existing off-base water wells, was conducted within (b) (6) of the AFFF release areas.

This SIR Addendum 01 discusses and provides a comparison of the follow-on analytical results to screening values for PFOS, PFOA, and PFBS in groundwater (on-base and off-base). The remaining PFAS do not have screening values; therefore, only the results of PFOS, PFOA, and PFBS are discussed in detail and presented in figures. However, all data are presented in the soil, groundwater, surface water, and sediment analytical tables provided in this SIR Addendum 01.

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2.0 BACKGROUND

Complete details on site location, setting, history and previous investigations performed at Cannon AFB are summarized in the SIR (Amec Foster Wheeler, 2018c).

2.1 INITIAL SITE INSPECTION

Data collection activities conducted during the initial SI consisted of collecting soil, sediment, surface water and/or groundwater samples at the AFFF release areas summarized in the SIR. The initial SI field activities were conducted in November and December 2017.

Review of analytical results of the initial SI indicated that PFAS are present in soil and groundwater at Cannon AFB in excess of applicable USEPA RSLs and LHA values. PFOS in surface soil was detected above the calculated RSL in AFFF release areas 2, 3, 4, 5, 9, and 11. PFOS in subsurface soil was detected above the calculated RSL in AFFF Release Area 5. PFOA and PFBS were detected in soil below the calculated RSLs, based on a residential scenario, at all AFFF release areas.

Between 30 November and 14 December 2017, groundwater samples were collected from 18 existing monitoring wells at Cannon AFB. The validated groundwater analytical results revealed the presence of PFOS, PFOA and/or the sum of PFOS and PFOA (PFOS+PFOA) at concentrations exceeding the LHA value of 0.07 µg/l in six monitoring wells (MW-Ca, MW-D, MW-Ga, MW-Pa, MW-Sa, and MW-Ta). Two monitoring wells, MW-Ga and MW-Pa are located in the east-central portion of the installation, southeast of the former sewage lagoon area (AFFF Release Area 5); and the remaining four monitoring wells (MW-Ca, MW-D, MW-Sa and MW-Ta) are located in the southeast corner of the installation, southeast of both the active fire training area (FTA), and former FTAs including; FTA No. 2 (Installation Restoration Program [IRP] Site FT-07), FTA No. 3 (IRP Site FT-08) and FTA No. 4 (IRP Site FTA-4).

PFBS was detected in groundwater at concentrations below the Tap Water Regional Screening Level (RSL) in 11 of 18 monitoring wells sampled.

Groundwater analytical results for PFOS, PFOA, PFOS+PFOA and PFBS (2017) are shown on **Figure 2.1-1,** and groundwater analytical results for all PFAS sampled are provided in **Table 2.1-1**.

2.2 HYDROGEOLOGIC SETTING

Cannon AFB is located in the Southern High Plains physiographic region of east-central New Mexico, near the center of the Llano Estacado sub-province (United States Geological Survey [USGS], 2006). The predominant geological formations in the vicinity of the installation consist of the Blackwater Draw, Ogallala, and Chinle Formations.

The surface soils at Cannon AFB are predominantly fine sandy loams of the Amarillo series, which consist of deep, well drained, moderately permeable soils derived from the sandy deposits of the Blackwater Draw Formation (United States Department of Agriculture [USDA], 2017). The Quaternary age Blackwater

Draw Formation is the uppermost geological unit at the installation and is composed primarily of eolian sand deposits ranging in thickness from 0 to 80 feet (USGS, 2006).

The Blackwater Draw Formation generally overlies the Tertiary age Ogallala Formation. The Ogallala is comprised of eolian sand and silt, and fluvial and lacustrine derived sand, silt, clay, and gravel, and generally ranges in thickness from 30 to 600 feet in eastern New Mexico (AECOM, 2011). The Ogallala Formation is the main water-yielding unit of the Southern High Plains Aquifer and lies unconformably atop the upper unit of the Chinle Formation (USGS, 2016). The Triassic Age Chinle Formation forms the bottom of the unconfined Southern High Plains Aquifer in the area of the installation and consists primarily of clay with some intermixed sand and silt, and ranges in thickness from 0 to 400 feet in eastern New Mexico (USGS, 2016).

The lower portion of the Ogallala is part of the Southern High Plains Aquifer that extends across parts of southeast New Mexico and northwest Texas, which in turn is part of the larger High Plains Aquifer that extends continuously from Wyoming and South Dakota into New Mexico and Texas. In the vicinity of Cannon AFB, the Southern High Plains Aquifer is an unconfined aquifer that serves as the primary regional aquifer for both potable and irrigation water. The underlying Chinle Formation, serves as the basal confining layer (aquitard) in eastern New Mexico (AECOM, 2011).

At Cannon AFB, the depth to groundwater ranges from approximately 280 to 350 feet below ground surface (FPM, 2017). Groundwater flow in the vicinity of Cannon AFB, is generally towards the southeast, with localized easterly and southerly flow components and is heavily influenced by the pumping of groundwater supplied, center-pivot irrigation wells located downgradient (southeast) of the installation (USGS, 2016).

Previous studies have been conducted to evaluate the hydrologic properties of the Southern High Plains Aquifer and to investigate potential seasonal fluctuations in groundwater flow direction associated with irrigation in the vicinity of Cannon AFB (USGS, 2016). The groundwater flow contours depicted in **Figure 2.2-1** and **Figure 2.2-2** were interpreted by the USGS to document findings from groundwater monitoring during both the irrigation and non-irrigation seasons. **Figure 2.2-1** shows groundwater elevation contours interpreted by the USGS from data collected in July 2013 to represent a typical irrigation season; and, **Figure 2.2-2** shows groundwater elevation contours interpreted by the USGS from data collected in January 2015 for a typical non-irrigation season (USGS, 2016). As shown in both **Figure 2.2-1** and **Figure 2.2-2**, the groundwater within the Ogallala Formation, at and near the installation, generally flows to the southeast during both the irrigation and non-irrigation seasons. Additionally, **Figures 2.2-1** and **2.2-2** identify the presence of a northwest-southeast trending groundwater trough that is evident in the southeast corner of the installation, extending several miles to the southeast. According to the USGS, this groundwater trough is the hydraulic expression of a Tertiary age paleochannel, which is a feature common within the Southern High Plains Aquifer that contains coarser, more hydraulically conductive, materials than the surrounding subsurface materials (USGS, 2016).

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Data collected during the November/December 2017 SI indicated that the depth to the uppermost groundwater at the installation ranges from approximately 287 feet below ground surface (bgs) at MW-X located in the southwest quadrant to 350 feet bgs at MW-V located in the northwest quadrant. Groundwater elevation ranged from 3981.45 feet above mean sea level (amsl) in MW-X (southwest quadrant of installation) to 3933.68 feet amsl in MW-Sa located in the southeast corner of the installation. Groundwater flow within this uppermost groundwater unit was generally towards the southeast, consistent with the data available from the USGS.

2.3 POTENTIAL RECEPTORS

Human receptors via the ingestion pathway are not present at Cannon AFB as the primary drinking water source for Cannon AFB is groundwater extracted from the Ogallala Aquifer using seven water supply wells located on-base, up-gradient of the identified AFFF release areas. The installation water supply wells were previously sampled as part of the Third Unregulated Contaminant Monitoring Rule for PFAS with no detections reported.

A review of water well records available from the New Mexico Office of the State Engineer (NMOSE), Water Rights Reporting System, identified the presence of 777 wells within 4-miles of the installation boundary. Of these 777 wells, 88 were identified as being potentially downgradient of the identified AFFF release areas and are shown on **Figure 2.3-1.** Of the downgradient wells identified within (b) (6) of the installation boundary, 10 wells are identified as 'domestic' or 'domestic and livestock' water supply wells, including one domestic and livestock water supply well located within (b) (6) of the installation boundary; 13 wells were identified as 'dairy'; two were identified as 'monitoring'; and 63 were identified as 'irrigation.'

The residents of the properties downgradient of the installation that currently obtain drinking water from the 'domestic' or 'domestic and livestock' wells are considered potential receptors via the groundwater ingestion pathway. Additionally, since no municipal water supply was identified in the area downgradient of the installation, it was assumed that residents of properties in this area were potentially using unregistered wells (i.e., wells that are not included in the NMOSE Water Rights Reporting System) or other types of wells (i.e., irrigation wells) for domestic purposes. In order to ensure that all potential drinking water wells were identified, an off-base reconnaissance consisting of a well inventory survey (door-to-door) was conducted within (b) (6) downgradient of the installation. The results of the well inventory survey are summarized in Section 3.0.

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3.0 FOLLOW-ON SI FIELD ACTIVITIES AND ANALYTICAL PROTOCOL

Follow-on SI activities were conducted at Cannon AFB between 28 August 2018 and February 14, 2019. Photographic documentation of the follow-on SI activities is provided in **Appendix A** and field documentation is provided in **Appendix B**. Inspection activities were recorded by field personnel on field activity daily logs (**Appendix B-1**). Daily PFAS protocol checklists were completed to ensure PFAS were not introduced by Amec Foster Wheeler employees or subcontractors in accordance with SOP AFW-01 (PFAS)–*Field Sampling Protocols to Avoid Cross-Contamination of PFAS* (**Appendix B-2**). A tailgate safety meeting was conducted each morning prior to beginning work, with the tailgate safety meeting reports provided in **Appendix B-3**.

Permanent Monitoring Well Installation and Well Development

One permanent groundwater monitoring well (MW-Y) was installed at the installation boundary, in a location downgradient of the former sewage lagoon area (AFFF release area 5) where PFOS and/or PFOS+PFOA were detected in groundwater above the LHA in 2017. The monitoring well was installed to evaluate the potential for PFOS and/or PFOS+PFOA to have migrated off-base relative to the former sewage lagoon area.

The monitoring well was installed by Cascade Environmental (Cascade), a New Mexico licensed driller using rotosonic methodology. Soil cores were continuously collected to the total depth of the well boring, screened with a portable photoionization detector (PID) for volatile organic vapors, and logged by a qualified geoscientist in accordance with the Unified Soil Classification System. Drilling information, PID readings, and geologic logging observations are included in the Soil Boring/Monitoring Well records provided in **Appendix B-4**.

The monitoring well was constructed using four-inch diameter, schedule 80, flush threaded polyvinyl chloride (PVC) riser casing and type 304, stainless steel, continuous slot, wire wrap flush threaded well screen possessing a 0.010-inch slot width (#10 slot) and end cap. The monitoring well screen length was 40 feet and the top of the screen was set approximately 3 feet above the field observed depth of the water table. The riser casing and screen were set in a minimum 8-inch diameter borehole. The annular space surrounding the well screen was backfilled with clean 20/40 silica sand during rotosonic drill casing withdrawal to approximately 3 feet above the top of the well screen. An approximate 8-foot bentonite transition seal was then installed above the sand pack and allowed to hydrate overnight before sealing the remaining borehole annulus with a cement/bentonite grout to grade.

The monitoring well was completed with an above-grade surface completion consisting of a steel protective casing with a 3-foot by 3-foot by 6-inch concrete pad set in the ground. The monitoring well was installed in accordance with SOP AFW-04, *Monitoring Well Installation* (Appendix D, General QPP) and in accordance with New Mexico Administrative Code Title 19, 027, 0004 and applicable rules and regulations for well construction outlined by the New Mexico Office of the State Engineer/Interstate

Stream Commission. Monitoring well construction details are presented in **Table 3.0-1** and are illustrated in the Soil Boring/Monitoring Well Records provided in **Appendix B-4**.

The new monitoring well was developed after the grout had been allowed to set for a minimum of 72 hours. Development was completed by surging and pumping with a stainless-steel submersible pump fitted with disposable high-density polyethylene (HDPE) tubing in accordance with SOP AFW-05 (PFAS), *Monitoring Well Development* (Appendix D, General QPP). Water quality parameters (pH, specific conductance, temperature, oxidation-reduction potential [ORP], dissolved oxygen [DO], and turbidity) of the development water were measured and recorded on a well development log, and a minimum of three saturated casing volumes of water was purged from the well during development. The development information was recorded on a Well Development form provided in **Appendix B-5**.

On-Base Groundwater Sampling

Groundwater sampling conducted as part of the follow-on SI activities was completed during two separate mobilizations. The first mobilization was conducted between 22 and 27 October 2018 and consisted of collecting groundwater confirmation samples from the six monitoring wells (MW-Ca, MW-D, MW-Ga, MW-Pa, MW-Sa, and MW-Ta) where PFOS, PFOA and/or PFOS+PFOA were previously detected at concentrations exceeding the LHA. The second mobilization was conducted between 11 and 14 February 2019 and consisted of development and sampling of the newly installed monitoring well (MW-Y).

Prior to collecting groundwater samples, depth to water measurements were collected from each well sampled. Groundwater elevation data is summarized in **Table 3.0-2.**

Groundwater samples from the first mobilization were collected with a stainless steel Grundfos SQE submersible pump fitted with stainless steel drop piping. The stainless steel drop piping was connected to a galvanized steel and a brass manifold which was connected to a flow-through cell whereby recovered groundwater was monitored for pH, temperature, specific conductivity, DO, and ORP. Turbidity was measured using a separate turbidity meter.

Groundwater samples from the second mobilization were collected with the same model of pump used during the first mobilization, which was attached to HDPE tubing using a stainless steel hose clamp. The tubing was connected directly to a flow-through cell at the well head whereby recovered groundwater was monitored for pH, temperature, specific conductivity, DO, and ORP. Turbidity was measured with a separate turbidity meter.

Groundwater sampling equipment was calibrated prior to use, with the resulting data recorded on water quality sampling instrument calibration forms contained in **Appendix B-6**. Purge water was pumped into a storage trailer tank through a 1-inch hose. Depth to water measurements, and field parameters, were monitored until groundwater indicator parameters reached stabilization criteria in accordance with SOP AFW-03 (PFAS)-*Groundwater Sampling* (Appendix D, General QPP). The flow-through cell was then removed and groundwater samples were collected directly into laboratory-provided HDPE containers

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from the brass discharge port. The sample containers were sealed, labeled, packed on ice in an insulated cooler, and delivered to Maxxam under chain-of-custody (CoC) protocol. Groundwater sampling activities were documented on Groundwater Sampling Logs provided in **Appendix B-7**.

Off-Base Private Well Survey and Groundwater Sampling

The off-base private well inventory survey and sampling was conducted during two separate mobilizations, the first mobilization was conducted between 27 and 30 August 2018 and the second was conducted between 25 and 27 September 2018. The private well survey area encompassed approximately (b) (6) of the AFFF release areas where PFAS was detected at concentrations above the LHA in 2017. During the door-to-door well inventory survey, a total of 21 property owners indicated they utilized wells for domestic (i.e., drinking water) purposes. Several property owners indicated that one or more wells were being utilized for domestic purposes, resulting in a total of 25 sampling locations being identified, in comparison to the 10 domestic wells identified in the NMOSE Water Rights Reporting System.

Prior to the Amec Foster Wheeler reconnaissance, Cannon AFB personnel coordinated with local property owners to communicate the background and purpose of the well inventory survey and to obtain permission from property owners to conduct water sampling on their property. A total of 19 primary water samples from 16 properties were collected during the first mobilization. Properties that could not be accessed during the first mobilization were revisited during the second mobilization and an additional six primary water samples were collected from six properties.

Private water supply sampling was conducted in accordance with SOP-AFW-13 (PFAS), *Private and Public Water Supply Well Sampling* (Appendix D, General QPP). The water samples were collected by filling sample containers directly from sample ports at each identified location. Amec Foster Wheeler personnel relied on information provided by property owners to select the most appropriate sampling location at each of the properties, with preference being to collect samples from tap or spigot locations, at, or near, the well head or pump house and before the water supply is introduced into any storage tanks or treatment units. In some instances, samples were required to be collected from manifolds at storage tanks due to conditions encountered in the field such as the well heads being inaccessible (i.e., buried or represented a confined space condition) or were not fitted with sampling ports. A summary of sample locations is provided in **Table 3.0-3.**

Prior to collecting each sample, the sampling port was allowed to flush for at least 15 minutes. The flow rate was measured and recorded to calculate the purge volume. During purging, a minimum of three sets of water quality parameters (pH, specific conductance, temperature, ORP, and DO) were collected. Groundwater sampling equipment was calibrated prior to use, with the resulting data recorded on water quality sampling instrument calibration forms contained in **Appendix B-6**. Following purging, the samples were collected directly from the sample port into laboratory-supplied containers. Private well sample collection logs were completed for each sample and copies are included in **Appendix B-7**.

Surveying

The newly installed monitoring well was surveyed by a New Mexico Licensed Professional Surveyor (Amec Foster Wheeler, Albuquerque, New Mexico) for horizontal coordinates, ground surface elevations and top of riser elevation. Horizontal coordinates were surveyed based on New Mexico State Plane Coordinate System, East Zone, United States Survey Feet, North American Datum of 1983. The elevation data were collected based on North American Vertical Datum of 1988. Survey data for the existing monitoring wells was provided by Cannon AFB personnel (**Table 3.0-1)**.

The horizontal coordinates for the off-base sampling locations were recorded in the field using a hand-held global positioning system.

Total Sample Counts

The following provides a summary of samples collected during follow-on SI activities at Cannon AFB:

- 13 water samples (including six primary groundwater samples, one duplicate sample and six equipment blank samples) were collected in October 2018 as part of the groundwater confirmation sampling effort;
- Three groundwater samples (including one duplicate sample and one equipment blank) were collected in February 2019 following installation of MW-Y;
- 53 water samples (including 25 primary groundwater samples, three duplicate samples and 25 field blanks [one per primary sample]), were collected in August and September 2018 at off-base sampling locations. The field blanks were initially held at the laboratory and subsequently analyzed for those primary samples where PFAS were detected at concentrations exceeding the LHA.

Samples collected during the follow-on SI were analyzed for the same 16 PFAS compounds as identified in the SIR.

Groundwater samples collected from base monitoring wells were analyzed by Maxxam and the off-base water samples were analyzed by Vista Analytical, both are DoD Environmental Laboratory Accreditation Program (ELAP) certified laboratories. Samples were analyzed by Modified USEPA Method 537 using Liquid Chromatography and Tandem Mass Spectrometry (LC-MS/MS). The LC-MS/MS method provides acceptable detection limits to confirm the presence of the PFAS listed above.

Analytical results for PFOS, PFOA, and PFBS are discussed in the following sections. The laboratory analytical reports for all PFAS constituents are included in **Appendix C**.

Co-occurrence of PFOS and PFOA (PFOS + PFOA) in aqueous samples was reported using the following guidelines:

This section provides information about private drinking water sources. It contains personal privacy or other information that is not publicly releasable under the Freedom of Information Act, 5 U.S.C. § 552, and is maintained in a separate portion of the Administrative Record that is not accessible to the public.

1. If PFOS and PFOA are both detected at concentrations at or above the laboratory detection limit (DL) in groundwater, then the reported concentration for PFOA was added to the reported concentration for PFOS.
2. If only PFOS or only PFOA is detected at or above the DL in groundwater, then the concentration of the detected analyte only is reported.
3. If neither PFOA nor PFOS are detected at concentrations at or above the DL, then co-occurrence was reported as *Not Detected*.

Data Validation and Usability Assessment

Analytical laboratory data from groundwater confirmation samples collected and analyzed for PFAS in October 2018 were validated by Amec Foster Wheeler in December 2018. A total of 13 water samples were collected during the groundwater confirmation sampling event, including one field duplicate, and six field blanks. During validation, Amec Foster Wheeler evaluated a total of 112 data records from field samples. No data were qualified during the validation and 100 percent of the data were considered fully usable without qualification. A copy of the data validation report is included as **Appendix D-1.**

Analytical laboratory data from drinking water samples collected and analyzed for PFAS in August 2018 were validated by Amec Foster Wheeler in September 2018. During validation, Amec Foster Wheeler evaluated a total of 352 data records from field samples and J qualified six records (1.7 percent) as estimated values because of analyte concentrations between the DL and limit of quantification (LOQ). No PFOS, PFOA or PFBS data were qualified. All data were considered fully usable with the qualification identified. A copy of the September 2018 data validation report is included as **Appendix D-2.**

Analytical laboratory data from drinking water samples collected and analyzed for PFAS in September 2018 were validated by Amec Foster Wheeler in October 2018. During validation, Amec Foster Wheeler evaluated a total of 112 data records from field samples and J qualified one record (0.9 percent) as an estimated value because of a detection of PFOA in sample CANON-(b) (6) between the DL and LOQ. All data were considered fully usable with the qualification identified. A copy of the October 2018 data validation report is included as **Appendix D-3.**

Analytical laboratory data from PFAS sampling of newly installed monitoring well (MW-Y) were validated by Amec Foster Wheeler in March 2019. A total of three water samples were collected during this sampling event, including one field duplicate, and one equipment blank. During validation, Amec Foster Wheeler evaluated a total of 32 data records from field samples. No data were qualified during the validation and 100 percent of the data were considered fully usable without qualification. A copy of the data validation report is included as **Appendix D-4.**

Investigation-Derived Waste

Investigation-Derived Waste (IDW) generated during the follow-on SI activities conducted on the Installation consisted of soil cuttings from monitoring well installation, well development water,

groundwater sampling purge water, equipment decontamination water, disposable personal protective equipment (PPE), and other miscellaneous refuse.

Used PPE and other miscellaneous refuse were placed in plastic bags and discarded into an on-site sanitary trash container for disposal at a sanitary landfill. Soil IDW was containerized in a 25 cubic yard roll-off box and liquid IDW was staged in a 4,000-gallon poly-tank. Composite groundwater and soil IDW samples were collected from the staged IDW generated during the follow-on SI. The samples were laboratory analyzed by Maxxam for PFAS and by CT Laboratories in Baraboo, Wisconsin for volatile organic compounds, semi-volatile organic compounds, pesticides, herbicides, and metals, polychlorinated biphenyls, total petroleum hydrocarbons (gasoline range organics and diesel range organics), flashpoint, pH, sulfide, and cyanide, to determine the applicable disposal options (**Appendix C**).

The IDW is currently being managed on-site pending receipt of analytical results. Waste disposal manifests will be provided under separate cover, following off-base transport and disposal.

3.1 AFFF RELEASE AREA 14: BASEWIDE GROUNDWATER

3.1.1 Sampling Summary

Six existing on-base groundwater monitoring wells; MW-Ca, MW-D, MW-Ga, MW-Pa, MW-Sa, and MW-Ta were resampled between 22 and 27 October 2018 to confirm the presence and concentrations of PFOS, PFOA and/or PFOS+PFOA that were detected at concentrations exceeding the LHA during the initial SI. The sample locations are shown on **Figure 3.0-1.**

A groundwater sample was also collected from the newly installed monitoring well (MW-Y) on February 13, 2019. This monitoring well was installed at the installation boundary to determine the presence of PFAS in groundwater, downgradient of the former sewage lagoon area (AFFF release area 5), where PFOS and/or PFOS+PFOA were detected in groundwater at concentrations exceeding the LHA during the initial SI. The location of MW-Y is shown on **Figure 3.0-1.**

3.1.2 Analytical Results

Nine groundwater samples (including two field duplicates) were collected for PFAS analysis. Groundwater analytical results are provided in **Table 3.1-1** and illustrated on **Figure 3.1-1.**

3.1.3 Conclusions

The results of the groundwater sampling confirmed the presence of PFOS, PFOA, and/or PFOS+PFOA at concentrations exceeding the LHA in the six wells which were resampled. The concentrations of each PFAS constituent were comparable to those reported in each monitoring well sampled in December 2017 and as reported in the Final SIR (Amec Foster Wheeler, 2018c).

The results of groundwater sampling from newly installed MW-Y confirmed the presence of PFOS, PFOA, PFOS+PFOA and PFBS, downgradient of the former sewage lagoon area (AFFF release area 5), where PFOS

and/or PFOS+PFOA were previously detected in groundwater above the LHA. The concentrations of PFOS and PFOS+PFOA in groundwater at MW-Y exceeded the LHA.

PFBS was not detected above the Tap Water RSL in groundwater.

3.2 OFF-BASE WATER SAMPLING

3.2.1 Sampling Summary

A total of 25 groundwater samples were collected at off-base locations where groundwater was being used as the primary drinking water. The sampling locations are shown on **Figure 3.0-2**.

3.2.2 Analytical Results

A total of 28 groundwater samples (including three field duplicates) were collected for PFAS analysis. The analytical results are provided in **Table 3.1-2** and illustrated on **Figures 3.2-1 and 3.2-2.**

3.2.3 Conclusions

The concentrations of PFOS, PFOA, and/or PFOS+PFOA in groundwater exceeded the LHA in three of the off-base samples ((b) (6) [redacted]). PFBS was not detected above the Tap Water RSL in off-base sample locations. Off-base groundwater sampling results confirm that groundwater impacted with PFAS at concentrations above the LHA values has migrated off-base to the southeast.

This section provides information about private drinking water sources. It contains personal privacy or other information that is not publicly releasable under the Freedom of Information Act, 5 U.S.C. § 552, and is maintained in a separate portion of the Administrative Record that is not accessible to the public.

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4.0 MIGRATION/EXPOSURE PATHWAYS AND TARGETS

An updated base-wide conceptual site model table is provided as **Table 4.0-1**. The table provides an overview of the facility, physical description, AFFF release area, land use, exposure, and ecological profiles for Cannon AFB. The table has been updated to include information collected during the follow-on SI. A detailed description of soil, sediment and surface water relative to source area conditions are provided in the SIR (Amec Foster Wheeler, 2018c).

4.1 GROUNDWATER MIGRATION PATHWAY

PFAS, once in groundwater, are highly mobile and will migrate near the same velocity as groundwater due to their high solubility and low partition coefficient value (i.e., soil/water as compared to other traditional chemicals such as benzene). Groundwater flow velocity in the vicinity of Cannon AFB is estimated to be on the order of 0.9 feet per day (ft/day). This estimate is based on an average hydraulic conductivity for the Ogallala aquifer of 60 feet/day (USGS, 1995), a hydraulic gradient of 0.003 feet per foot (AECOM, 2011), and an effective porosity of 0.2 (estimated based on Cannon AFB geology). PFAS are chemically and biologically stable in the environment and resist typical environmental degradation processes. PFBS is generally less toxic and less bioaccumulative in wildlife and humans (USEPA, 2017b).

During the follow-on SI activities, PFOS, PFOA, and/or PFBS were detected in groundwater at six existing basewide monitoring wells. PFOS, PFOA, and/or PFOS+PFOA exceeded the LHA value of 0.07 µg/L in monitoring wells MW-Ga and MW-Pa located east of the former sewage lagoons and in monitoring wells MW-Ca, MW-D, MW-Sa and MW-Ta, all located in the southeast corner of the installation. These findings were consistent with those reported in the Final SIR (Amec Foster Wheeler, 2018c). PFBS was detected at concentrations below the USEPA Tap Water RSL in all groundwater samples collected during the follow-on SI activities.

Based on the current PFAS analytical results, groundwater at Cannon AFB is impacted with PFOS, PFOA and/or PFOS+PFOA at concentrations above the LHA at locations downgradient of the former sewage lagoon area (AFFF release area 5) and the fire training areas (former and active) located in the southeast corner of the installation (AFFF release areas 1, 2, 3 and 11). Although groundwater is regulated basewide by NMED, AFFF release areas 1, 2, 3, 5 and 11 are considered groundwater release areas for pathway analysis.

The primary groundwater exposure targets include off-base property owners located within the Tertiary-age paleochannel, immediately southeast of the Cannon AFB installation boundary, and downgradient of AFFF release areas 1, 2, 3, 5, and 11. Potential exposure routes in drinking water include ingestion of impacted groundwater.

4.2 GROUNDWATER EXPOSURE CONCLUSIONS

Human receptors via the ingestion pathway are present downgradient of Cannon AFB.

Due to the detections of PFOS, PFOA and/or PFOS+PFOA at concentrations exceeding the LHA values in off-base properties where groundwater is used as a source of drinking water, the USAF implemented emergency response measures and immediately offered bottled water to impacted property owners to mitigate the ingestion exposure.

Routine bottled water delivery service is ongoing at one of the affected properties and will continue until longer term water treatment technologies are implemented. The second property declined the bottled water service; however, they informed the Air Force that instead of bottled water, they prohibited consumption of water for all personnel at the property, a condition that will also continue until water treatment systems are installed.

5.0 SUMMARY AND CONCLUSIONS

As stated in Section 1.0, the objectives of this follow-on study were to:

- Determine whether PFAS are present in groundwater further downgradient of monitoring wells where the presence of PFOS, PFOA and/or PFOS+PFOA was confirmed at concentrations above the LHA); and,
- Determine if PFOS and/or PFOA are present in groundwater at concentrations exceeding the LHA value in off-base water wells where groundwater is currently used as a drinking water source for human consumption.

Section 3 of this SIR Addendum 01 detailed the analytical results for PFAS included in this follow-on SI. A summary table (**Table 5.0-1**) is also provided below which lists specific exceedances by area and media, fulfilling the objectives of the follow-on SI.

Table 5.0-1. Summary of Analytical Results and Screening Level Exceedances.

Location ID	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level	Potentially Complete DW Exposure Pathway	Recommen-dation
AFFF Release Area 14	Groundwater - Existing Wells							
	PFOS	25	0.07	µg/L	6/4	Yes	Yes	Advance to RI
	PFOA	2.8	0.07	µg/L	6/4	Yes		
	PFOS+PFOA	27	0.07	µg/L	6/6	Yes		
	PFBS	0.97	40	µg/L	6/0	No		
Off-Base Survey Area	Off-Base							
	PFOS	1.1	0.07	µg/L	25/3	Yes	Yes	Interim Response Action
	PFOA	0.539	0.07	µg/L	25/2	Yes		
	PFOS+PFOA	1.649	0.07	µg/L	25/3	Yes		
	PFBS	0.210	40	µg/L	25/0	No		

Notes:
* includes normal and field duplicate samples (count does not include QC samples)
AFFF – aqueous film forming foam
DW – Drinking Water
J – The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample
µg/L – micrograms per liter
ND – not detected
PFBS – perfluorobutanesulfonic acid
PFOS – perfluorooctanesulfonic acid
PFOA – perfluorooctanoic acid

Groundwater Receptors

Human receptors via the ingestion pathway are present downgradient of Cannon AFB. Due to the detections of PFOS, PFOA and/or PFOS+PFOA at concentrations exceeding the LHA values in off-base properties where groundwater is used as a source of drinking water, the USAF implemented emergency response measures to mitigate immediate exposure. Bottled water was immediately offered to impacted property owners to mitigate the ingestion exposure. Routine bottled water delivery service is ongoing at one of the affected properties and will continue until longer term water treatment technologies are implemented. The second property declined the bottled water service; however, they informed the Air Force that instead of bottled water, they prohibited consumption of water for all personnel at the property, a condition that will also continue until water treatment systems are installed.

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FIGURES

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FIGURE ACRONYMS

AFFF	aqueous film forming foam
ft bgs	feet below ground surface
µg/L	micrograms per liter
PFAS	per- and polyfluorinated alkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

FIGURE NOTES

Purple shaded = Exceeds applied USEPA Health Advisory Value or RSL
Groundwater elevations in NAVD88 (feet)
[A] Higher concentration observed in field duplicate sample
J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample
Off-base well locations are provided from the New Mexico Office of State Engineer's Water Rights Database. Well use codes shown on figures include:

DAI	DAIRY OPERATION
DOL	72-12-1 DOMESTIC AND LIVESTOCK WATERING
DOM	72-12-1 DOMESTIC ONE HOUSEHOLD
IRR	IRRIGATION
MON	MONITORING WELL
PUB	72-12-1 CONSTRUCTION OF PUBLIC WORKS

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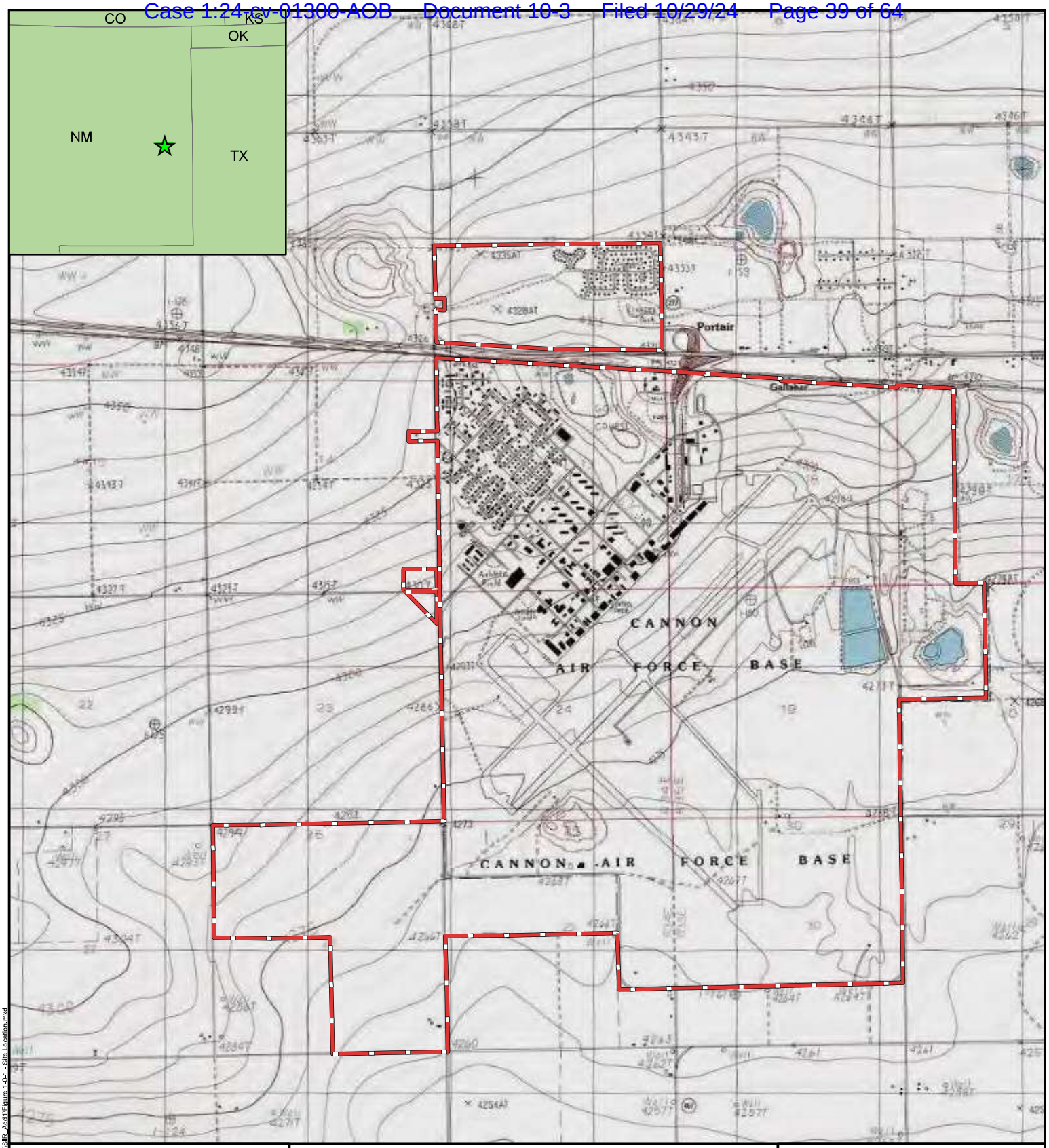

Air Force Civil Engineer Center

2261 Hughes Ave., Suite 163
JBSA Lackland, Texas 78236

Project: 775303101.CNFO01

By: M.Vavra | Date: 3/1/2019

0 1,500 3,000 Feet

Symbol Key

Cannon AFB Installation Boundary

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FIGURE 1.0-1
Installation Location Map
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report Addendum 01

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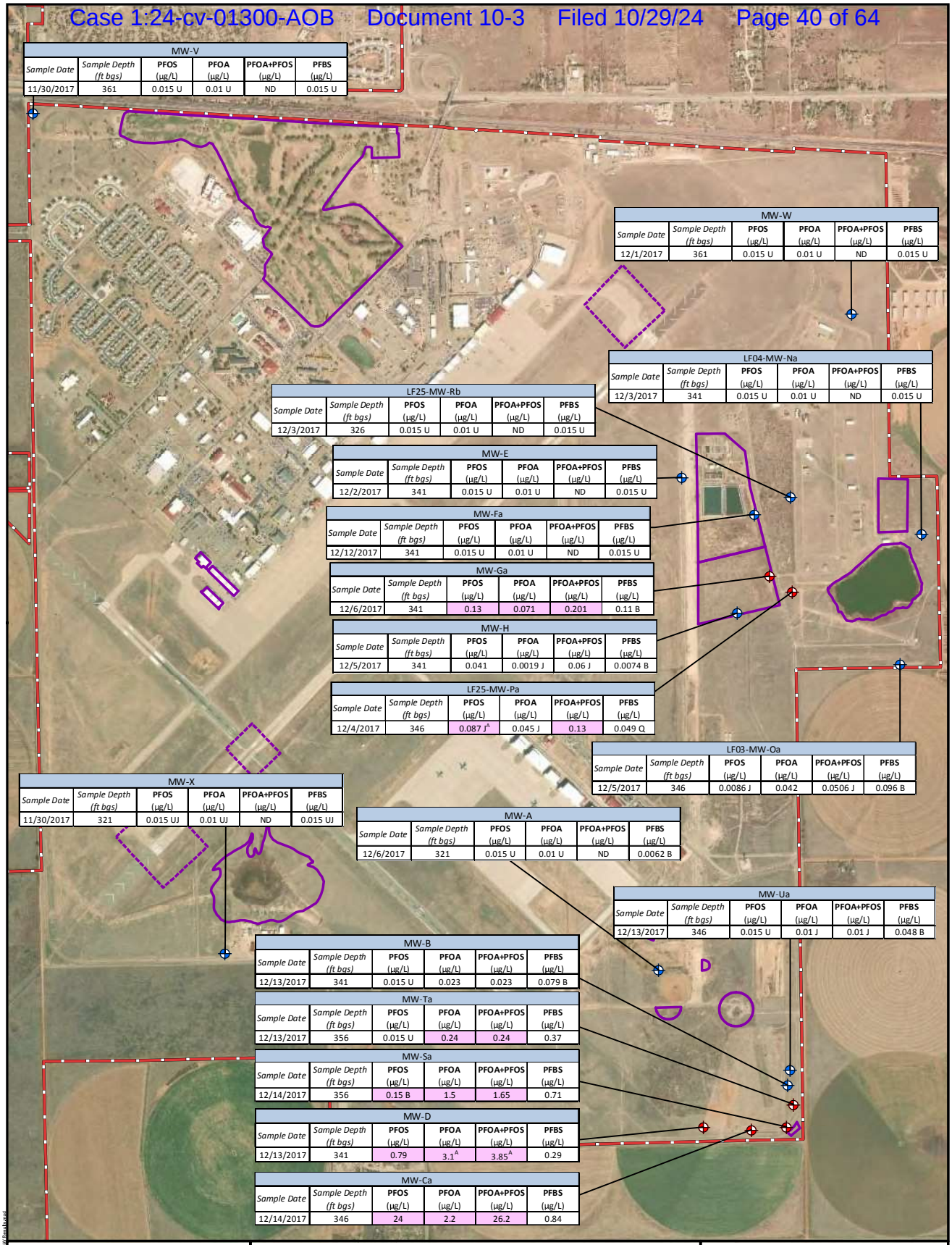

MW-V

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
11/30/2017	361	0.015 U	0.01 U	ND	0.015 U

MW-W

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/1/2017	361	0.015 U	0.01 U	ND	0.015 U

LF04-MW-Na

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/3/2017	341	0.015 U	0.01 U	ND	0.015 U

LF25-MW-Rb

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/3/2017	326	0.015 U	0.01 U	ND	0.015 U

MW-E

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/2/2017	341	0.015 U	0.01 U	ND	0.015 U

MW-Fa

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/12/2017	341	0.015 U	0.01 U	ND	0.015 U

MW-Ga

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/6/2017	341	0.13	0.071	0.201	0.11 B

MW-H

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/5/2017	341	0.041	0.0019 J	0.06 J	0.0074 B

LF25-MW-Pa

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/4/2017	346	0.087 J[A]	0.045 J	0.13	0.049 Q

LF03-MW-Oa

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/5/2017	346	0.0086 J	0.042	0.0506 J	0.096 B

MW-X

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
11/30/2017	321	0.015 UJ	0.01 UJ	ND	0.015 UJ

MW-A

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/6/2017	321	0.015 U	0.01 U	ND	0.0062 B

MW-Ua

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/13/2017	346	0.015 U	0.01 J	0.01 J	0.048 B

MW-B

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/13/2017	341	0.015 U	0.023	0.023	0.079 B

MW-Ta

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/13/2017	356	0.015 U	0.24	0.24	0.37

MW-Sa

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/14/2017	356	0.15 B	1.5	1.65	0.71

MW-D

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/13/2017	341	0.79	3.1[A]	3.85[A]	0.29

MW-Ca

Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
12/14/2017	346	24	2.2	26.2	0.84

Air Force Civil Engineer Center

[redacted]
2261 Hughes Ave., Suite 163
JBSA Lackland, Texas 78236

Project: 775303101.CNFO01

By: M.Vavra

Date: 3/1/2019

0 1,000 2,000 Feet

Symbol Key

- Monitoring Well
- Monitoring Well with PFAS Exceedance
- AFFF Release Area
- AFFF Release Area (Approximate)
- Cannon AFB Installation Boundary

ft bgs	feet below ground surface
ug/L	micrograms per liter
PFAS	Per- and Polyfluoroalkyl Substances
PFOS	Perfluorooctanesulfonic acid
PFOA	Perfluorooctanoic acid
PFBS	Perfluorobutanesulfonic acid
U	The analyte was analyzed for but was not detected above the reported limit of detection.
J	The result is estimated
B	The analyte was found in an associated blank
ND	PFOA+PFOS could not be calculated due to non-detects
A	A higher concenteration was observed in the field duplicate sample and is shown

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FIGURE 2.1-1
2017 Groundwater Analytical Results (On-Base)
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report Addendum 01

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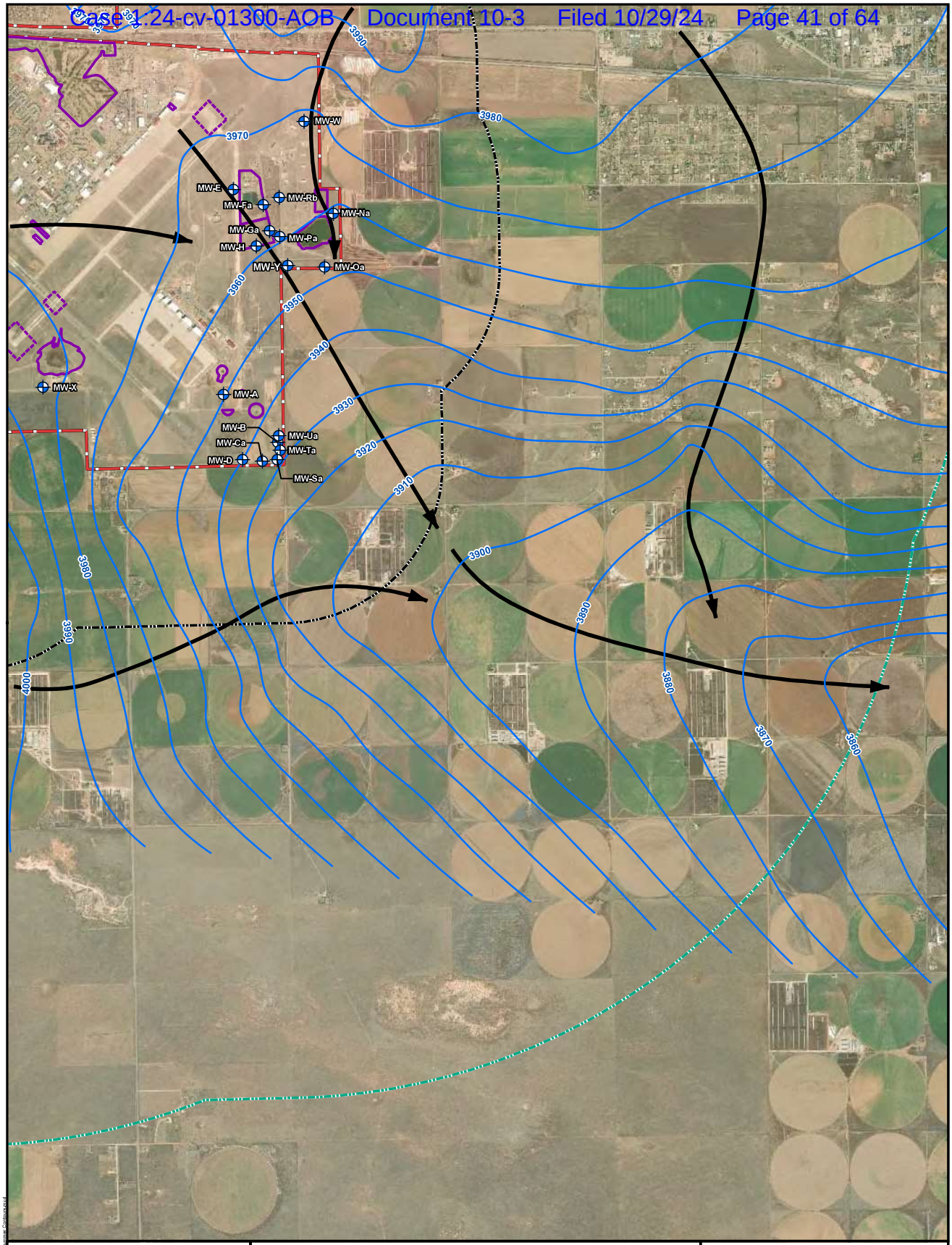

Air Force Civil Engineer Center

[redacted]
2261 Hughes Ave., Suite 163
JBSA Lackland, Texas 78236

Project: 775303101.CNFO01

By: M.Vavra | Date: 3/5/2019

0 3,000 6,000 Feet

Symbol Key

- Monitoring Well
- Approximate Groundwater Elevation Contour - Summer (USGS July 2013)
- Approximate Groundwater Flow Direction (USGS 2013)
- AFFF Release Area
- AFFF Release Area (Approximate)
- Cannon AFB Installation Boundary
- 1-Mile Installation Boundary
- 4-Mile Installation Boundary

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FIGURE 2.2-1
2013 Groundwater Elevation Contours (Irrigation Season)
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report Addendum 01

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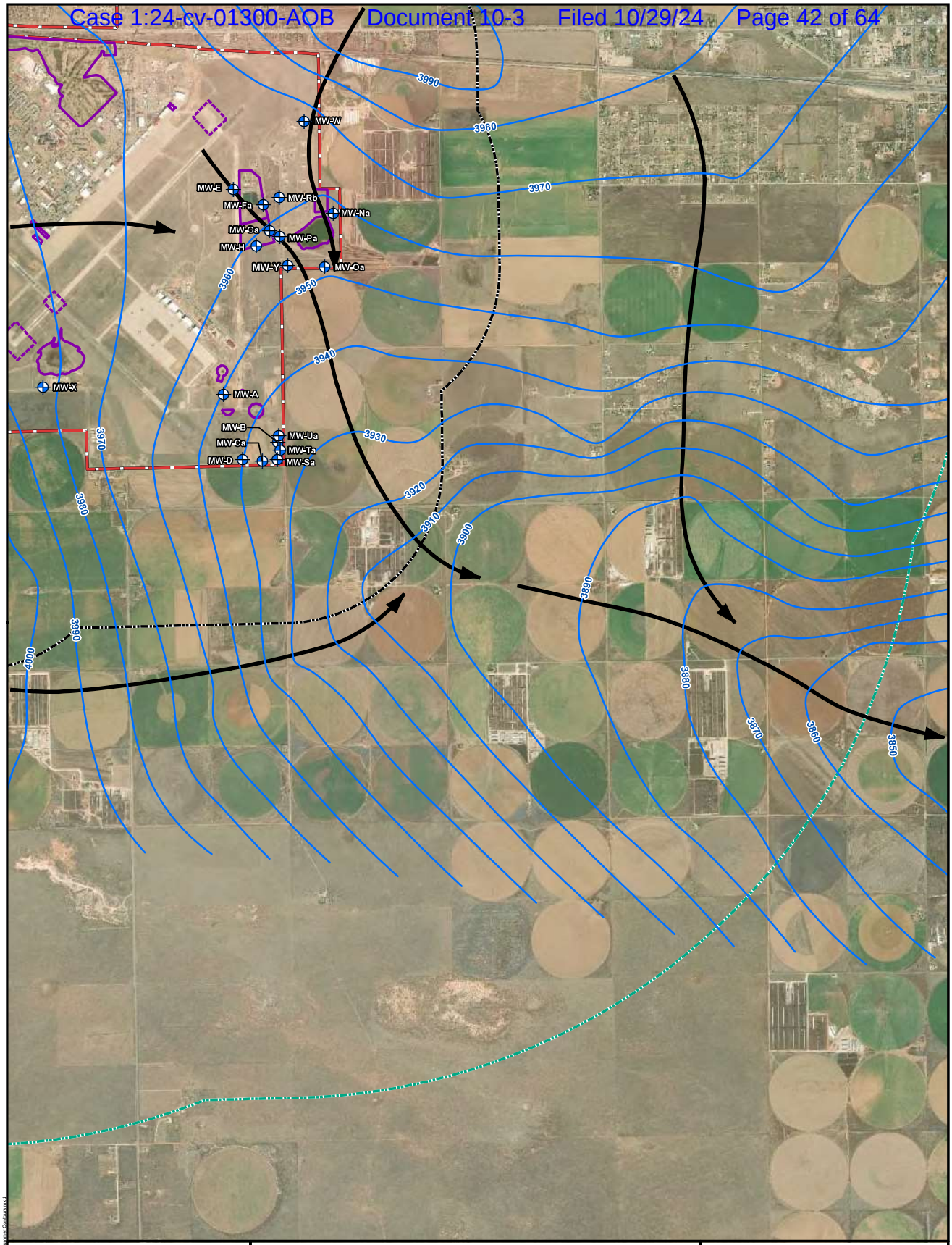

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JBSA Lackland, Texas 78236

Project: 775303101.CNFO01

By: M.Vavra | Date: 3/5/2019

0 3,000 6,000 Feet

Symbol Key

- Monitoring Well
- Approximate Groundwater Elevation Contour - Winter (USGS January 2015)
- Approximate Groundwater Flow Direction (USGS 2015)
- AFFF Release Area
- AFFF Release Area (Approximate)
- Cannon AFB Installation Boundary
- 1-Mile Installation Boundary
- 4-Mile Installation Boundary

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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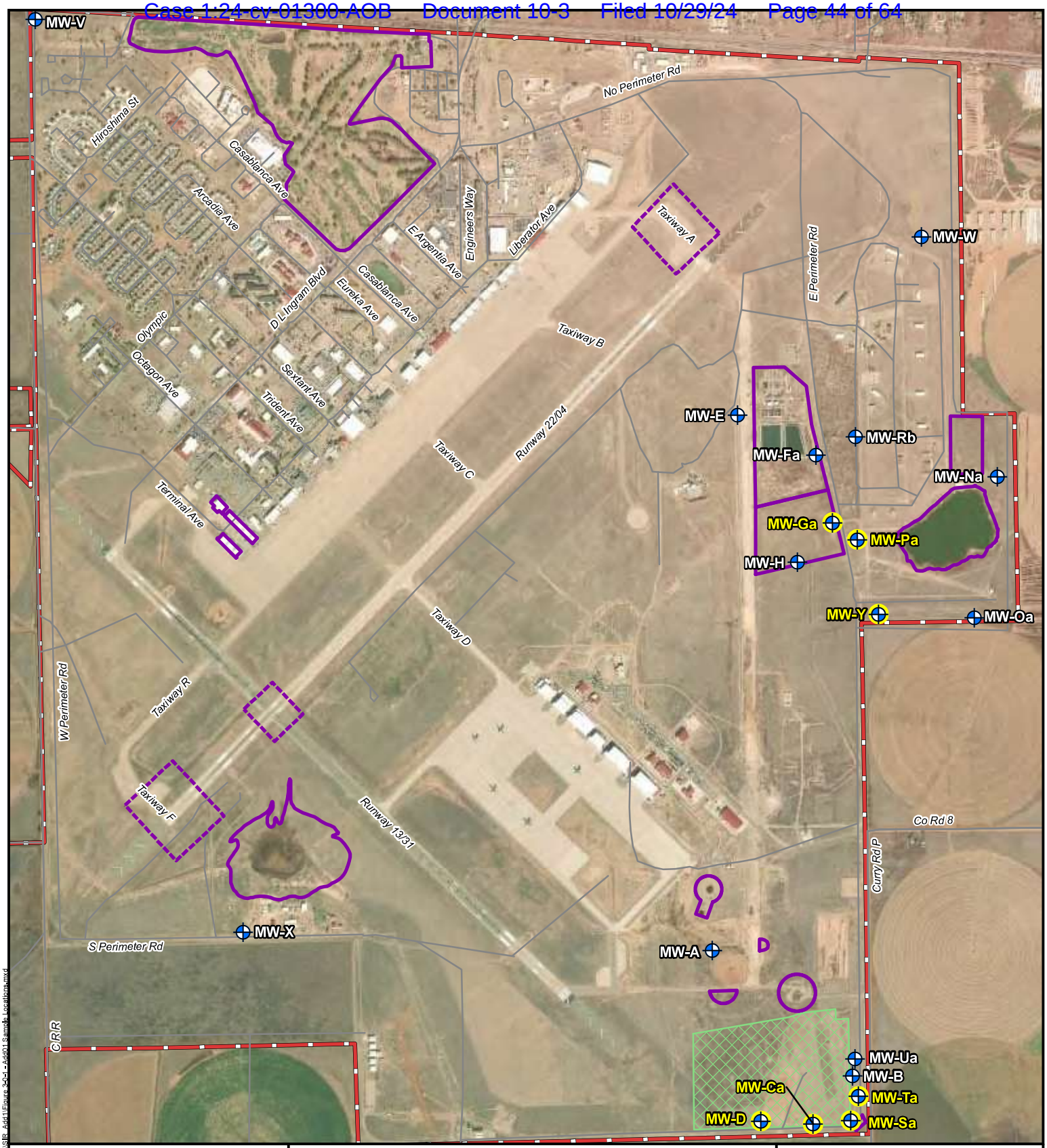
FIGURE 2.2-2
2015 Groundwater Elevation Contours (Non-Irrigation Season)
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report Addendum 01

Document Path: H:\Projects\775303101_USAF_Active_PFCs\0008_CannonAFB\GIS\ArcMap\SIR_Add1\Figure 2-2-2_Summer_Contours.mxd

Figure 2.3-1 provides information about the type and location of off-base private sampling sources. It contains personal privacy information that is not publicly releasable under the Freedom of Information Act, 5 U.S.C. § 552, and is maintained in a separate portion of the Administrative Record that is not accessible to the public.



Air Force Civil Engineer Center

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JBSA Lackland, Texas 78236

Project: 775303101.CNFO01

By: M.Vavra | Date: 3/5/2019

0 500 1,000 2,000 Feet

Symbol Key

- Monitoring Well Location Sampled for Follow On Activites
- Monitoring Well Location
- Roads
- AFFF Release
- AFFF Release Area (Approximate)
- Cannon AFB Installation Boundary
- Landfill 5

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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FIGURE 3.0-1
On-Base Groundwater Sample Locations
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report Addendum 01

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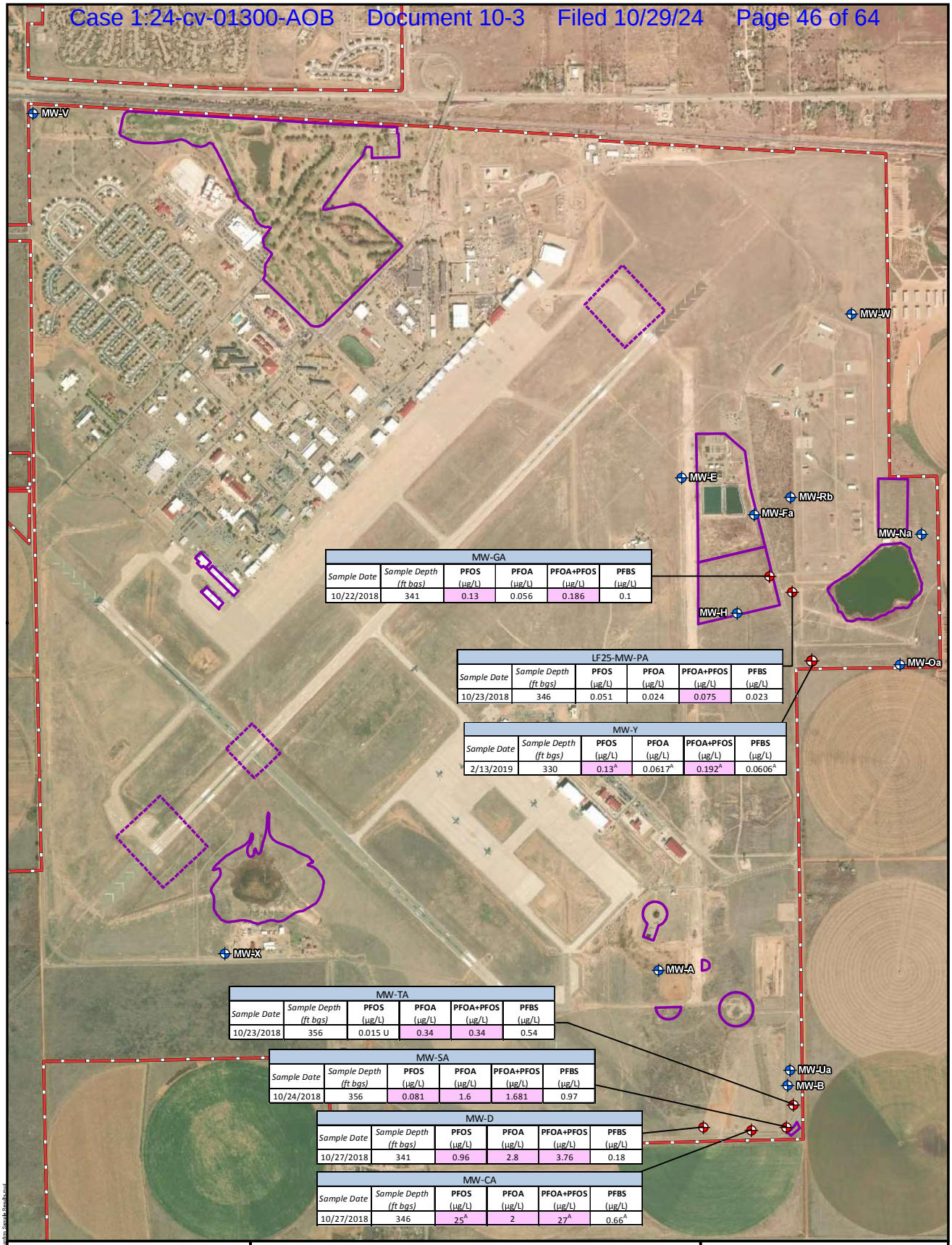
Figure 3.0-2 provides information about the type and location of off-base private sampling sources. It contains personal privacy information that is not publicly releasable under the Freedom of Information Act, 5 U.S.C. § 552, and is maintained in a separate portion of the Administrative Record that is not accessible to the public.



MW-GA					
Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
10/22/2018	341	0.13	0.056	0.186	0.1

LF25-MW-PA					
Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
10/23/2018	346	0.051	0.024	0.075	0.023

MW-Y					
Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
2/13/2019	330	0.13[A]	0.0617[A]	0.192[A]	0.0606[A]

MW-TA					
Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
10/23/2018	356	0.015 U	0.34	0.34	0.54

MW-SA					
Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
10/24/2018	356	0.081	1.6	1.681	0.97

MW-D					
Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
10/27/2018	341	0.96	2.8	3.76	0.18

MW-CA					
Sample Date	Sample Depth (ft bgs)	PFOS (µg/L)	PFOA (µg/L)	PFOA+PFOS (µg/L)	PFBS (µg/L)
10/27/2018	346	25[A]	2	27[A]	0.66[A]

Air Force Civil Engineer Center

[redacted]
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Project: 775303101.CNFO01

By: M.Vavra | Date: 3/5/2019

0 1,000 2,000 Feet

Symbol Key

- Monitoring Well
- Monitoring Well with PFAS Exceedance
- AFFF Release Area
- AFFF Release Area (Approximate)
- Cannon AFB Installation Boundary

ft bgs feet below ground surface
ug/L micrograms per liter
PFAS Per- and Polyfluoroalkyl Substances
PFOS Perfluorooctanesulfonic acid
PFOA Perfluorooctanoic acid
PFBS Perfluorobutanesulfonic acid
U The analyte was analyzed for but was not detected above the reported limit of detection.
A A higher concenteration was observed in the field duplicate sample and is shown

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FIGURE 3.1-1
2018/2019 Groundwater Analytical Results (On-Base)
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report Addendum 01

Figure 3.2-1 provides information about the type and location of off-base private sampling sources. It contains personal privacy information that is not publicly releasable under the Freedom of Information Act, 5 U.S.C. § 552, and is maintained in a separate portion of the Administrative Record that is not accessible to the public.

Figure 3.2-2 provides information about the type and location of off-base private sampling sources. It contains personal privacy information that is not publicly releasable under the Freedom of Information Act, 5 U.S.C. § 552, and is maintained in a separate portion of the Administrative Record that is not accessible to the public.

TABLES

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Table 2.1-1
Summary of 2017 Groundwater Analytical Testing Results
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon Air Force Base, New Mexico

						Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	PFOS+PFOA	Perfluorobutanesulfonic acid (PFBS)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
Analyte:																						
Health Advisory[1]:						0.07	0.07	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
EPA RSL Tapwater[2]:						NA	NA	NA	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AFFF Area	**Location**	**Sample ID**	**Sample Date**	**Sample Depth (ft.)**	**Sample Type**	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
14	LF03-MW-OA	CANON14-GW-010	05-Dec-17	346.0-346.0	N	0.0086 J	0.042	0.0506	0.096 B	0.058	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.075	0.41	0.34	0.018 U	0.01 U	0.01 U	0.01 U
	LF04-MW-NA	CANON14-GW-009	03-Dec-17	341.0-341.0	N	0.015 U	0.01 U	ND	0.015 U	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.015 U	0.015 U	0.01 U	0.018 U	0.01 U	0.01 U	0.01 U
	LF25-MW-PA	CANON14-GW-011	04-Dec-17	346.0-346.0	N	0.085 J	0.045 J	0.13 J	0.049 Q	0.01 J	0.015 U	0.0057 J	0.0039 J	0.015 U	0.01 U	0.068 J	0.32	0.34 J	0.018 U	0.01 U	0.01 U	0.01 U
		CANON-FD-GW-002	04-Dec-17	346.0-346.0	FD	0.087 J	0.042 J	0.129 J	0.046 Q	0.0099 J	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.07 J	0.35	0.37 J	0.018 U	0.01 U	0.01 U	0.01 U
	LF25-MW-RB	CANON14-GW-012	03-Dec-17	326.0-326.0	N	0.015 U	0.01 U	ND	0.015 U	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.015 U	0.015 U	0.026 B	0.018 U	0.01 U	0.01 U	0.01 U
	MW-A	CANON14-GW-001	06-Dec-17	321.0-321.0	N	0.015 U	0.01 U	ND	0.0062 B	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.015 U	0.015 U	0.018 B	0.018 U	0.01 U	0.01 U	0.01 U
	MW-B	CANON14-GW-002	13-Dec-17	341.0-341.0	N	0.015 U	0.023	0.023	0.079 B	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.014 J	0.061	0.18 B	0.018 U	0.01 U	0.01 U	0.01 U
	MW-CA	CANON14-GW-003	14-Dec-17	346.0-346.0	N	24	2.2	26.2	0.84	12	0.075 U	0.05 U	0.05 U	0.075 U	0.05 U	1.3	12	4.1	0.064 J	0.05 U	0.05 U	0.05 U
	MW-D	CANON14-GW-004	13-Dec-17	341.0-341.0	N	0.79	2.8	3.59	0.29	1.9	0.075 U	0.05 U	0.05 U	0.075 U	0.05 U	0.81	9	1.8	0.09 U	0.05 U	0.05 U	0.05 U
		CANON-FD-GW-001	13-Dec-17	341.0-341.0	FD	0.75	3.1	3.85	0.28	2	0.03 U	0.02 U	0.02 U	0.03 U	0.02 U	0.89	9.9	1.9	0.036 U	0.02 U	0.02 U	0.02 U
	MW-E	CANON14-GW-005	02-Dec-17	341.0-341.0	N	0.015 U	0.01 U	ND	0.015 U	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.015 U	0.015 U	0.01 U	0.018 U	0.01 U	0.01 U	0.01 U
	MW-FA	CANON14-GW-006	12-Dec-17	341.0-341.0	N	0.015 U	0.01 U	ND	0.015 U	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.015 U	0.026	0.019 B	0.018 U	0.01 U	0.01 U	0.01 U
	MW-GA	CANON14-GW-007	06-Dec-17	341.0-341.0	N	0.13	0.071	0.201	0.11 B	0.015 J	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.1	0.43	0.65	0.018 U	0.01 U	0.01 U	0.01 U
	MW-H	CANON14-GW-008	05-Dec-17	341.0-341.0	N	0.041	0.019 J	0.06 J	0.0074 B	0.033	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.019 J	0.1	0.033 B	0.018 U	0.01 U	0.01 U	0.01 U
	MW-SA	CANON14-GW-013	14-Dec-17	356.0-356.0	N	0.15 B	1.5	1.65	0.71	0.36 B	0.015 U	0.01 U	0.0036 J	0.015 U	0.01 U	0.47	3.8	2.3	0.018 U	0.01 U	0.01 U	0.01 U

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Table 2.1-1
Summary of 2017 Groundwater Analytical Testing Results
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon Air Force Base, New Mexico

						Analyte:	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	PFOS+PFOA	Perfluorobutanesulfonic acid (PFBS)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
						Health Advisory[1]:	0.07	0.07	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
						EPA RSL Tapwater[2]:	NA	NA	NA	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AFFF Area	**Location**	**Sample ID**	**Sample Date**	**Sample Depth (ft.)**	**Sample Type**		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
14	MW-TA	CANON14-GW-014	13-Dec-17	356.0-356.0	N	0.015 U	0.24	0.24	0.37	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.088	0.45	0.94	0.018 U	0.01 U	0.01 U	0.01 U
	MW-UA	CANON14-GW-015	13-Dec-17	346.0-346.0	N	0.015 U	0.01 J	0.01 J	0.048 B	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.0076 J	0.031 B	0.085 B	0.018 U	0.01 U	0.01 U	0.01 U
	MW-V	CANON14-GW-016	30-Nov-17	361.0-361.0	N	0.015 U	0.01 U	ND	0.015 U	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.015 U	0.015 U	0.01 U	0.018 U	0.01 U	0.01 U	0.01 U
	MW-W	CANON14-GW-017	01-Dec-17	361.0-361.0	N	0.015 U	0.01 U	ND	0.015 U	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.015 U	0.015 U	0.01 U	0.018 U	0.01 U	0.01 U	0.01 U
	MW-X	CANON14-GW-018	30-Nov-17	321.0-321.0	N	0.015 UJ	0.01 UJ	ND	0.015 UJ	0.015 UJ	0.015 UJ	0.01 UJ	0.01 UJ	0.015 UJ	0.01 UJ	0.015 UJ	0.015 UJ	0.01 UJ	0.018 UJ	0.01 UJ	0.01 UJ	0.01 UJ

Notes:

PFAS analysis by Modified USEPA Method 537 using Liquid Chromatography and Tandem Mass Spectrometry

[1]Health Advisory from USEPA Office of Water, 2016a and 2016b, Health Advisories (HAs) for drinking water.

[2]USEPA Residential Screening Levels (November 2017a) [https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017]

Highlighted cells indicate concentrations exceeding USEPA Health Advisory

PFOS+PFOA = Co-occurrence of PFOA and PFOS (PFOA+PFOS) in aqueous samples is reported using the following guidelines

1. If both PFOA and PFOS are detected at or above the detection limit (DL), then the sum of PFOA+PFOS is reported
2. If only PFOS or only PFOA is detected at or above the DL in groundwater, then the concentration of the detected analyte only is reported
3. If neither PFOA nor PFOS is detected at or above the DL, then PFOA + PFOS is reported as "ND" representing Not Detected

FD - field duplicate sample

ft - feet

ID - identification

B - The analyte was detected in the sample and an associated blank and the concentration detected in the sample was less than ten times the concentration detected in the blank.

J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

µg/L - micrograms per liter

N - normal field sample

Q - The analyte is both B qualified because of blank detections and J qualified as an approximate concentration.

U - The analyte was analyzed for but was not detected above the reporting limit of detection (LOD).

UJ - The reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

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Table 3.0-1
Monitoring Well Construction Details
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon AFB, Clovis, New Mexico

AFFF Release Area	Location ID	Installation Date	Well Material	Northing	Easting	Ground Elevation (ft amsl)	TOC elevation (ft amsl)	Well Depth (ft bgs)	Well Diameter (in)	Screen Length (ft)	Screen Size (in)	Screen Interval (ft bgs)
14	MW-CA	8/16/2017	PVC	3804012.24	655902.16	4266.32	4269.32	350	4	20	0.01	329.7-349.7
	MW-D	12/16/1984	PVC	3804023.15	655699.10	4265.20	4266.9	355	4	15	0.01	340-355
	MW-GA	8/27/2017	PVC	3806357.44	655978.71	4279.37	4281.88	355.5	4	35	0.01	320.2-355.2
	LF25-MW-PA	2/21/2004	PVC	3806290.62	656074.74	4274.07	4274.73	361.54	4	60	0.01	296.54-356.54
	MW-SA	8/16/2017	PVC	3804025.09	656050.12	4263.86	4266.3	362	4	40	0.01	321.7-361.7
	MW-TA	8/8/2017	PVC	3804119.85	656079.96	4263.91	4266.48	362.4	4	35	0.01	327.4-362.4
	MW-Y	2/6/2019	PVC	3805999.08	656157.13	4271.535	4274.0975	357	4	40	0.01	316.4-356.4

Notes:
AFFF - aqueous film forming foam
amsl - above mean sea level
bgs - below ground surface
ft - feet
in - inches
PVC - Polyvinyl Chloride
TOC - top of casing
Coordinates are displayed in NAD 83 UTM Zone 13 North

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Table 3.0-2
Groundwater Elevations
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon AFB, New Mexico

AFFF Release Area	Location ID	Well Depth (ft bgs)	Ground Surface Elevation (ft amsl)	TOC elevation (ft amsl)	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft amsl)	Date Measured
14	MW-CA	350	4266.32	4269.32	337.01	3932.31	10/27/2018
	MW-D	355	4265.20	4266.9	330.5	3936.4	10/27/2018
	MW-GA	355.5	4279.37	4281.88	324.42	3957.46	10/22/2018
	LF25-MW-PA	361.54	4274.07	4274.73	318.62	3956.11	10/23/2018
	MW-SA	362	4263.86	4266.3	334.96	3931.34	10/24/2018
	MW-TA	362.4	4263.91	4266.48	334.17	3932.31	10/23/2018
	MW-Y	357	4271.535	4274.0975	322.09	3952.0075	2/13/2019

Notes:

AFFF - aqueous film forming foam

amsl - above mean sea level

bgs - below ground surface

btoc - below top of casing

ft - feet

TOC - top of casing

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Table 3.0-3
Off-Base Sampling Location Summary
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon Air Force Base, New Mexico

(b) (6)

Table 3.0-3 provides information about the type and location of off-base private sampling sources. It contains personal privacy information that is not publicly releasable under the Freedom of Information Act, 5 U.S.C. § 552, and is maintained in a separate portion of the Administrative Record that is not accessible to the public.

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Table 3.0-3
Off-Base Sampling Location Summary
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon Air Force Base, New Mexico

(b) (6)

Table 3.0-3 provides information about the type and location of off-base private sampling sources. It contains personal privacy information that is not publicly releasable under the Freedom of Information Act, 5 U.S.C. § 552, and is maintained in a separate portion of the Administrative Record that is not accessible to the public.

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Table 3.1-1
Summary of Follow-On Site Inspection Groundwater Analytical Testing Results (On-Base)
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon Air Force Base, New Mexico

					Analyte:	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	PFOS+PFOA	Perfluorobutanesulfonic acid (PFBS)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
					Health Advisory:	0.07	0.07	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					EPA RSL Tapwater[1]:	NA	NA	NA	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AFFF Area	**Location**	**Sample ID**	**Sample Date**	**Sample Depth (ft.)**	**Sample Type**	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
14	LF25-MW-PA	CANON14-GW-022	23-Oct-18	346.0-346.0	N	0.051	0.024	0.075	0.023	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.034	0.16	0.19	0.018 U	0.01 U	0.01 U	0.01 U
	MW-CA	CANON14-GW-019	27-Oct-18	346.0-346.0	N	22	2	24	0.65	8.5	0.075 U	0.05 U	0.05 U	0.075 U	0.05 U	1.1	8.9	3.6	0.09 U	0.05 U	0.05 U	0.05 U
		CANON-FD-003	27-Oct-18	346.0-346.0	FD	25	2	27	0.66	8.7	0.15 U	0.1 U	0.1 U	0.15 U	0.1 U	1.1	9.5	3.7	0.18 U	0.1 U	0.1 U	0.1 U
	MW-D	CANON14-GW-020	27-Oct-18	341.0-341.0	N	0.96	2.8	3.76	0.18	1.7	0.03 U	0.02 U	0.02 U	0.03 U	0.02 U	0.73	8.5	1.5	0.036 U	0.02 U	0.02 U	0.02 U
	MW-GA	CANON14-GW-021	22-Oct-18	341.0-341.0	N	0.13	0.056	0.186	0.1	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.081	0.36	0.58	0.018 U	0.01 U	0.01 U	0.01 U
	MW-SA	CANON14-GW-023	24-Oct-18	356.0-356.0	N	0.081	1.6	1.681	0.97	0.18	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.45	3.1	2.8	0.018 U	0.01 U	0.01 U	0.01 U
	MW-TA	CANON14-GW-024	23-Oct-18	356.0-356.0	N	0.015 U	0.34	0.34	0.54	0.015 U	0.015 U	0.01 U	0.01 U	0.015 U	0.01 U	0.11	0.62	1.4	0.018 U	0.01 U	0.01 U	0.01 U
	MW-Y	CANON14-GW-025	13-Feb-19	316.0-356.0	N	0.123	0.0567	0.180	0.0575	0.249	0.031 U	0.031 U	0.031 U	0.0077 U	0.0077 U	0.102	0.358	0.309	0.0077 U	0.0077 U	0.0077 U	0.0077 U
		CANON14-FD-GW-004	13-Feb-19	316.0-356.0	FD	0.13	0.0617	0.192	0.0606	0.268	0.031 U	0.031 U	0.031 U	0.0077 U	0.0077 U	0.109	0.375	0.332	0.0077 U	0.0077 U	0.0077 U	0.0077 U

[1]Health Advisory from USEPA Office of Water, 2016a and 2016b, Health Advisories (HAs) for drinking water.

[2]USEPA Residential Screening Levels (November 2017a) [https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017]

Highlighted cells indicate concentrations exceeding USEPA Health Advisory

PFOS+PFOA = Co-occurrence of PFOA and PFOS (PFOA+PFOS) in aqueous samples is reported using the following guidelines

1. If both PFOA and PFOS are detected at or above the detection limit (DL), then the sum of PFOA+PFOS is reported
2. If only PFOS or only PFOA is detected at or above the DL in groundwater, then the concentration of the detected analyte only is reported
3. If neither PFOA nor PFOS is detected at or above the DL, then PFOA + PFOS is reported as "ND" representing Not Detected

FD - field duplicate sample

ft - feet

ID - identification

B - The analyte was detected in the sample and an associated blank and the concentration detected in the sample was less than ten times the concentration detected in the blank.

J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

µg/L - micrograms per liter

N - normal field sample

U - The analyte was analyzed for but was not detected above the reporting limit of detection (LOD).

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Table 3.1-2
Summary of Off-Base Analytical Testing Results
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon Air Force Base, New Mexico

(b) (6)

Table 3.1-2 provides information about the type and location of off-base private sampling sources. It contains personal privacy information that is not publicly releasable under the Freedom of Information Act, 5 U.S.C. § 552, and is maintained in a separate portion of the Administrative Record that is not accessible to the public.

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Table 3.1-2
Summary of Off-Base Analytical Testing Results
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon Air Force Base, New Mexico

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[redacted]

[1]Health Advisory from USEPA Office of Water, 2016a and 2016b, Health Advisories (HAs) for drinking water.

[2]USEPA Residential Screening Levels (November 2017a) [https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-november-2017]

Highlighted cells indicate concentrations exceeding USEPA Health Advisory

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1. If both PFOA and PFOS are detected at or above the detection limit (DL), then the sum of PFOA+PFOS is reported
2. If only PFOS or only PFOA is detected at or above the DL in groundwater, then the concentration of the detected analyte only is reported
3. If neither PFOA nor PFOS is detected at or above the DL, then PFOA + PFOS is reported as "ND" representing Not Detected

FD - field duplicate sample

ft - feet

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B - The analyte was detected in the sample and an associated blank and the concentration detected in the sample was less than ten times the concentration detected in the blank.

J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

µg/L - micrograms per liter

N - normal field sample

U - The analyte was analyzed for but was not detected above the reporting limit of detection (LOD).

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Table 4.0-1
Conceptual Site Model: Installation-Wide Summary
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon AFB, Clovis, New Mexico

Facility Profile	Physical Profile	Release Profile	Land Use and Exposure Profile	Ecological Profile
Installation Description/History: • Years of operation: 1942 to the present. • Size: Approximately 3,789 acres. • Location: Eastern New Mexico, approximately 7 miles southwest of the City of Clovis, in Curry County, New Mexico. • Layout: The installation is comprised of two perpendicular active runways in the central and southwestern portions; maintenance, support, and operational facilities west of the central runway/flightline; supplemental hangars and apron areas in the south-central region; a wastewater treatment plant to the east; and, a golf course and residential and service facilities in the northwestern portion (HGL, 2015). • History: Cannon AFB dates to 1929 when Portair Field was established as a civilian passenger terminal. The Army Air Corps took control of the civilian airfield in 1942 and it became known as the Clovis Army Air Base. The installation was renamed Clovis Army Air Field in early 1945, where flying, bombing, and gunnery classes continued until the installation was deactivated in May 1947. The installation was reassigned to the TAC and formally reactivated as Clovis AFB in 1951, and subsequently renamed Cannon AFB in 1957 (Versar, 2013). • Current Mission: Home to the 27th SOW where it conducts infiltration/exfiltration, combat support, tilt-rotor operations, helicopter aerial refueling, close air support, unmanned aerial vehicle operations, non-standard aviation, and other special missions. It directs the deployment, employment, training, and planning for squadrons that operate the AC-130W, MC-130J, CV-22B, C-146A, U-28A, MQ-1, MQ-9, and provides operational support to flying operations (Versar, 2013).	**Topography:** •The installation is situated in the Southern High Plains Physiographic Province near the center of the Llano Estacado subprovince. This area is a nearly flat plain sloping gently (10 to 15 feet per mile) to the east and southeast. In the vicinity of Cannon AFB, elevations range from 4,250 to 4,350 feet above mean sea level (AECOM, 2011). **Vegetation:** • Vegetation at Cannon AFB is typical of semiarid, short grass prairies (Plains-Mesa grassland) and is limited by water availability (CH2MHill, 1983). • Much of the Llano Estacado (80-90%) has been tilled for agriculture, with farmers producing cotton, corn, and wheat under dryland agriculture or irrigated with water pumped from the Ogallala Aquifer (USEPA, 2006). **Surface Water:** • Permanent surface water streams are non-existent in the Cannon AFB vicinity. Running Water Draw, located approximately 10 miles north of the installation, is the nearest drainage feature and is dry for much of the year. • Historically, surface runoff at Cannon AFB has drained into four natural, ephemeral, playas. Two of the northern playas were converted into plastic-lined golf course ponds. The southern playa, known as South Playa Lake, occupies approximately 9 acres south of the intersection of the main jet runways and is approximately 15 feet deep. Since 1943, stormwater runoff from the flightline has collected in this playa where it either evaporates or percolates into the soil. The northern playa, known as North Playa Lake, was bermed on the north, west, and south sides with topsoil and concrete debris. It covers approximately 13 acres and received treated effluent from the former sewage lagoons (AECOM, 2011). **Soils:** • Soils at Cannon AFB are predominantly fine sandy loams of the Amarillo series, which consists of very deep, well drained, moderately permeable soils derived from loamy eolian sediments from the Blackwater Draw Formation of the Pleistocene (United States Department of Agriculture [USDA], 2017). **Geology:** • The subsurface geology of the Southern High Plains aquifer at Cannon AFB includes the Chinle, Ogallala, and Blackwater Draw Formations. • The Chinle Formation of Triassic Age forms the bottom of the unconfined Southern High Plains Aquifer in this area, and consists primarily of clay with some intermixed sand and silt, and ranges in thickness from 0 to 400 feet in eastern New Mexico. • The Ogallala Formation of Tertiary Age is the main water-yielding unit of the Southern High Plains Aquifer and lies unconformably atop the upper unit of the eastward-dipping Chinle Formation. The Ogallala Formation consists of eolian sand and silt and fluvial and lacustrine sand, silt, clay, and gravel, and ranges in thickness from 30 to 600 ft in eastern New Mexico and west Texas. • The Blackwater Draw Formation of Quaternary Age generally overlies the Ogallala Formation at Cannon AFB. The Blackwater Draw Formation is	**Contaminants of Potential Concern:** • PFAS are the contaminants of potential concern for this investigation. • Fuel related compounds and chlorinated solvents are historical site contaminants. **Media of Potential Concern:** • Soil, sediment, surface water, and groundwater. **Confirmed AFFF Releases:** • Former FTA No. 2: Possible AFFF use from 1970 to 1974 in unlined FTA with an unknown volume of AFFF used for firefighting training. PFOS and PFOA were detected in both surface and subsurface soil at concentrations below the calculated RSL. PFBS was not detected. • Former FTA No. 3: Possible AFFF use from 1970 to 1974 in an unlined FTA with an unknown volume of AFFF used for firefighting training. PFOS was detected above the calculated RSL in surface soil but was not detected in subsurface soil. PFOA was detected below the calculated RSL in the surface soil but not detected in subsurface soil. PFBS was not detected. • Former FTA No.4: Possible AFFF use from 1974 to 1995 with an unknown volume of AFFF used for firefighting training. PFOS was detected above the calculated RSL in surface soil but was not detected in subsurface soil. PFOA was detected at concentrations below the calculated RSL in surface and surface soil. PFBS was detected in subsurface soil at concentrations below the calculated RSL. • Hangar 119 and 133: Accidental releases of AFFF inside the hangars likely discharged to grassy areas outside the hangars. PFOS was detected above the calculated RSL in surface soil samples and below the calculated RSL in subsurface samples (28 to30 feet bgs). PFOA and PFBS were detected below the calculated RSL in surface and subsurface soil samples. • Former Sewage Lagoons: Operated between 1966 and 1998; during operation, lagoons received any AFFF that entered the sanitary sewer system. Evidence of AFFF releases in hangars during this time period, which may have entered the sanitary sewer system and been routed to the former sewage lagoons. Only subsurface soil sampling was conducted as part of SI activities as surface material was fill material. PFOS was detected above the calculated RSL in subsurface soil. PFOA and PFBS were detected below the calculated RSL in subsurface soil. • North Playa Lake Outfall: Any wastewater collected at the WWTP containing AFFF would be passed on to North Playa Lake. Several releases of AFFF from hangars entered the sanitary sewer system and were routed to the WWTP. PFOS was detected in sediment samples at concentrations below the calculated RSL. PFOA and PFBS were not detected in sediment. PFOS and PFOS+PFOA were detected/calculated in surface water at concentrations exceeding the USEPA HA value (0.07 µg/L). PFOA was detected in surface water at concentrations below the USEPA HA value. PFBS was detected in surface water at concentrations below the USEPA Tap Water RSL. • South Playa Lake Outfall: Any stormwater or wastewater containing AFFF that enters storm drains near the flightline is routed to South Playa Lake. Several releases of AFFF from hangars entered nearby storm drains and	**Current Land Use:** • Occupied by Cannon AFB. **Future Land Use:** • Land use is not expected to change in the future. **Potential Receptors:** • Potential receptors associated with current and future land use include USAF personnel and residents, grounds maintenance workers, utility workers, construction workers. • Recreational users of Whispering Winds Golf Course. • Off-base groundwater users located downgradient of PFAS impacted groundwater identified at the southeastern area of the base.	**Potential Ecological Receptors:** • Inland and aquatic plant species, reptiles, birds, soil invertebrates, and mammals that inhabit or migrate through the installation. **Threatened and Endangered Species:** • Threatened species that were identified in Curry County and may exist at Cannon AFB include the following: • Lesser prairie-chicken (*Tympanuchus pallidicinctus*) – under review.

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Table 4.0-1
Conceptual Site Model: Installation-Wide Summary
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon AFB, Clovis, New Mexico

Facility Profile	Physical Profile	Release Profile	Land Use and Exposure Profile	Ecological Profile

AFFF Use:
• AFFF containing PFAS was used for firefighting training activities, testing of firefighting equipment, extinguishing petroleum fires, and in fire suppression systems at several installation buildings.
• Fourteen potential AFFF release areas were recommended for SI at Cannon AFB:
  • Former FTA No. 2;
  • Former FTA No. 3;
  • Former FTA No. 4;
  • Hangars 119 and 133;
  • Former Sewage Lagoons;
  • North Playa Lake Outfall;
  • South Playa Lake Outfall;
  • Whispering Winds Golf Course Outfall.
  • Hangar 109;
  • Active FTA;
  • Landfill #4;
  • Perimeter Road Fuel Spill
  • Flightline Crash Areas; and,
  • Basewide Groundwater
	composed primarily of eolian sand deposits, and ranges in thickness from 0 to 80 feet in eastern New Mexico.
	• A caliche layer is typically present in the unsaturated zone of the Blackwater or Ogallala Formations in New Mexico.
	Hydrogeology:
	• The lower portion of the Ogallala Formation is the primary regional aquifer for both potable and irrigation water.
	• The Ogallala Aquifer is part of the Southern High Plains Aquifer that extends across parts of southeast New Mexico and northwest Texas, which in turn is part of the larger High Plains Aquifer that extends continuously from Wyoming and South Dakota into New Mexico and Texas.
	• Cannon AFB is underlain by the portion of the Ogallala Aquifer designated the Curry County Underground Water Basin. The Ogallala Aquifer is a water table, or unconfined, aquifer with the underlying Chinle redbeds serving as the basal confining layer in eastern New Mexico.
	• At Cannon AFB, the depth to groundwater is approximately 300 feet bgs. The saturated thickness in 1990 ranged from 93 to 143 feet, but continues to decrease. Groundwater flow is generally from northwest to southeast (FPM, 2014).
	• Depth to water measurements collected in November and December 2017 as part of the SI ranged from 287.78 feet below top of casing (btoc) in monitoring well MW-X located in the southwest portion of the installation to 351.80 feet btoc in monitoring well MW-H located on the south side of the former sewage lagoon. The calculated groundwater elevations ranged from 3981.45 feet above mean sea level (amsl) in MW-X to 3929.38 feet amsl at MW-H.
	Meteorology:
	• Average annual rainfall is 17.9 inches/year in Clovis, New Mexico.
	• Average number of days with measurable rainfall is 54 days.
	• Average high temperature of 92°F occurs in July, while an average low of 23.4°F occurs in January.
		were routed to the lake. PFOS and PFOA were detected in both surface and subsurface soil at concentrations below the calculated RSL. PFBS was not detected in surface or subsurface soil.
		• Whispering Winds Golf Course Outfall: The golf course began receiving effluent from the WWTP plant in approximately 2002. Currently, the golf course stores effluent in a storage tank on the eastern portion of the course. Effluent is regularly used for golf course irrigation and filling the two golf course ponds. A release of AFFF into any of the hangar floor trenches or fire station stalls would be routed through the WWTP. As such, effluent from the WWTP used at the golf course may contain AFFF. PFOS was detected in sediment samples at concentrations below the calculated RSL. PFOA and PFBS were not detected in sediment. PFOS and PFOS+PFOA were detected/calculated in surface water at concentrations below the USEPA HA value (0.07 µg/L). PFOA and PFBS were not detected in surface water.
		• Hangar 109: A recent release of AFFF inside the hangar/mechanical rooms resulted in AFFF being released outside the hangar and draining to grassy areas outside the hangar. PFOS was detected above the calculated RSL in surface soil but was not detected in subsurface soil samples. PFOA and PFBS were detected below the calculated RSL in the surface soil sample and was not detected in the subsurface soil sample.
		• Landfill No. 4: Landfill is located immediately north of the North Playa Lake. Cover was irrigated using water from North Playa Lake where wastewater from WWTP (potentially including AFFF) was discharged. Groundwater was sampled downgradient of the landfill (monitoring well LF04-MW-Na). No PFOS, PFOA, or PFBS were detected.
		• Active FTA: Lined evaporation pond located south of the FTA where AFFF/water mix is collected and left to evaporate has been repaired in the past. Any damage to liner would result in AFFF being released to environment. In addition, an extreme flood event in May 2015 likely resulted in the evaporation pond overflowing, allowing residual AFFF to infiltrate into surrounding soil. PFOS was detected above the calculated RSL in surface soil and below the calculated RSL in subsurface soil. PFOA was detected in surface soil at concentrations below the calculated RSL and was not detected in subsurface soil. PFBS was not detected in surface or subsurface soil.
		• Perimeter Road Fuel Spill: AFFF was sprayed from crash fire trucks onto a fuel spill associated with an overturned tanker trunk on the southeast side of Perimeter Road. No PFOS, PFOA or PFBS were detected in surface or subsurface soil.
		• Flightline Crash Areas: Cannon AFB Fire Department noted three separate crash areas along the flightline where AFFF was released during crash response activities. No soil sampling was conducted relative to the crash sites. Results of groundwater monitoring from locations downgradient of the crash sites is summarized below.
		• Basewide Groundwater: Groundwater was evaluated for all identified AFFF release areas; however, since groundwater at Cannon AFB is regulated basewide by NMED rather than specific to individual areas of		

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Table 4.0-1
Conceptual Site Model: Installation-Wide Summary
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Addendum 01 Site Inspection Report, Cannon AFB, Clovis, New Mexico

Facility Profile	Physical Profile	Release Profile	Land Use and Exposure Profile	Ecological Profile
		concern, a separate AFFF release area (Release Area 14) was identified for evaluating the presence of PFAS in basewide groundwater. PFOS, PFOA, and/or PFBS were detected in groundwater at 11 existing basewide monitoring wells. PFOS, PFOA and PFOS+PFOA exceeded the USEPA HA value (0.07 µg/L) in six monitoring wells: MW-Ga and LF25-MW-Pa located southeast of the sewage lagoon area; and at monitoring wells MW-Ca, MW-D, MW-Sa and MW-Ta located in the southeast corner of the installation. Confirmation sampling was completed for MW-Ga, LF25-MW-Pa, MW-Ca, MW-D, MW-Sa, and MW-Ta. PFOS, PFOA and/or PFOS+PFOA exceeded the USEPA HA value (0.07 µg/L) again in all six monitoring wells. • Analytical results from groundwater sampling of newly installed monitoring well (MW-Y) confirmed the presence of PFOS, PFOA and PFOS+PFOA. The concentrations of PFOS and PFOS+PFOA exceeded the USEPA HA value (0.07 µg/L). The monitoring well is located at the installation boundary, downgradient (southeast) of the former sewage lagoon area. • Off-Base Groundwater: 25 water samples were collected from off-base properties, downgradient of Cannon AFB where groundwater was used as a source of drinking water. PFOS, PFOA and/or PFOS+PFOA exceeded the USEPA HA value (0.07 µg/L) in three sample locations. • **Primary Release Pathways:** • Release or application of AFFF to the ground at potential source areas. • Infiltration of PFAS deeper into the soil column over time and reaching groundwater. • AFFF washed into drainage, stormwater, and sewer systems. **Secondary Release Pathways:** • Irrigation utilizing water from the WWTP. • Irrigation utilizing impacted groundwater		

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APPENDICES

Due to file size restrictions, the Appendices have been removed and are uploaded as (Part 2) of this document.